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Did $100 Million Mistake Lead To RCA Exit?

By Nancy French
Of the CW Staff

NEW YORK – RCA Corporate officials who decided to close down that firm's computer operations did so using projections that contained a $100 million mistake, V. Orville Wright, a witness for the government in its antitrust trial against IBM, said here last week.

At the same time, Wright revealed that Mohawk Data Systems offered RCA $80 million more for its computer business than did Univac but, for reasons he "was not privy to," corporate officials sold to Univac instead.

Wright, who is currently president of MCI Communications Corp., was president of RCA's Systems Development Division at the time RCA decided to exit from the computer business.

Under cross-examination by IBM lead attorney Thomas D. Barr, Wright said the mistake was discovered after the Sept. 17, 1971 announcement to discontinue manufacturing and selling computer products.

Julius Koppelman, then financial adviser to the Computer Division's president, L. Edwin Donegan Jr., discovered the error after the decision was made at the corporate level with no input from the Computer Division itself.

Wright attributed the error to "a misunderstanding of how cash flowed to RCA from accrued equity contracts" or full payout leases.

RCA corporate officials underestimated this revenue and, as a result, overestimated the amount of cash the division would have needed to continue in business. Given the error, the sum was more than they wanted to spend.

Never Consulted

Wright said neither he nor Donegan had ever been consulted about the decision prior to the announcement. Had they been invited to participate in the decision and had they discovered the error in time, RCA's history might have read differently.

About two weeks after the Sept. 17, 1971 announcement, several DP staff members – Wright

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CW Photo by A. Dooley

Hewlett-Packard's Bill Tilly makes a point about the HP 2644A terminal to Bob Loomis (left) on the Computer Caravan's exhibit floor last week.

DPers Urged to Advance Careers on Own Initiative

By Don Leavitt
Of the CW Staff

WOBURN, Mass. – While management should be concerned about supporting and encouraging employee capabilities and aspirations, it is equally important for the individual worker in a DP installation to be concerned about his own career, according to Robert McMahon, manager of management and information systems and planning at BASF Corp.

Leading a Computer Caravan workshop on career pathing here last week, McMahon outlined 10 points he believes each member of a DP staff should keep in mind in planning and assessing any progress to be made in establishing or enhancing a career.

First, he noted, the process has to be "a very personal activity." The individual has to define his own long-range goals and then prioritize them.

Goal-setting is extremely difficult early in a career, but if the individual recognizes they may change over time, a recitation of what his goals are "right now" shouldn't be too difficult, McMahon added.

Perhaps even more important than goal-setting, however, is the worker's need to define the interrelation between his personal life and his career. The idea that an employee owes 100% of his time to the company is unrealistic and "disfunctional," he said.

An individual's own development must be planned; just aiming at the next job or the next promotion is not enough.

"You should identify specific stages of

Computer Caravan coverage continues on Pages 4, 7 and 8.

responsibility desired and aim at new experiences that will complement your previous work, so you'll be ready for that new responsibility when it does come," McMahon told workshop attendees.

But critical self-evaluation is important. It's old-hat to "recognize your strengths and your weaknesses," he said, but an honest appraisal of why a given situation was a success or failure can provide real insight into the capabilities and interests the individual really has.

Word of Warning

Almost as a word of warning, McMahon then noted that where the person works may be just as vital as what he does. Certainly the "internal" environment is important to the worker's disposition and effectiveness, he said, but it must be realized that an individual's "track record" includes identification with the overall reputation of prior employers, he cautioned.

Learn to interview "all of those around you, including your boss, fellow employees and subordinates," he urged the workshop. People often speak but don't listen; interviewing is a deliberate attempt to have two-way discussions, he added.

In seeking recognition, "play your strongest hand," which isn't necessarily the one in which the individual has had the longest period of experience, McMahon went on.

He must recognize what he has done or what he has been particularly interested

(Continued on Page 8)

Paradyne, Delta Among Vendors Unveiling Products at Caravan

CW Staff Roundup

WOBURN, Mass. – Paradyne Corp. was among several firms which introduced products here last week at the opening of the Computer Caravan.

Paradyne unveiled an upgraded version of its Parallel Interface Extender (PIX) data communications system. Called the PIX II, the unit operates directly on the multiplexer channel of an IBM 360/370 CPU.

The PIX II microprocessor-based system handles Synchronous Data Link Control (SDLC) communications on a point-to-point basis with another PIX unit at a remote site, the company said.

The two PIX units transmit data in a Paradyne-implemented version of SDLC protocol. To the CPU, however, the data communications devices emulate the operation of a standard I/O device operating on the channel, a spokesman said.

The advantage of this configuration is that there is no software overhead from communications access methods or network control programs for the user to contend with, he said.

A PIX II unit can handle card readers, printers and punches operating in local mode at the DP center as well as terminal devices at the remote site. SDLC capability is loaded into the PIX random-access memory (RAM) storage through specialized software provided by the company to the user in cassette form.

(Continued on Page 8)

Peripherals, Terminal Makers Dominate Federal DP Expo '76

By Edith Holmes
Of the CW Staff

WASHINGTON, D.C. – Hardware, and particularly peripherals and terminals, dominated Federal DP Expo '76 held here two days last week.

Designed to attract government users alone last year, this year's show was open to the whole industry and, by the end of the first day, had drawn a crowd of 2,400. A total of 3,500 people attended the exposition a year ago, and Marketing Ventures, Inc., the organization sponsoring the show, hoped to pull 5,000 to the exhibits at the Sheraton Park Hotel this time.

The show boasted 120 booths, 90 exhibitors and 24 technical sessions, all run by vendors. While only seven software and four time-sharing firms were represented at the exhibition, they provided topics, people and visual aids for the majority of these sessions.

Most of the hardware shown was small-scale equipment. Data General Corp. had the largest booth and the only mainframes. And those CPUs, the Eclipse

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RCA Exit Blamed on $100 Million Error

(Continued from Page 1)

and Donegan included – were invited to New York to meet with board chairman Robert Sarnoff, ostensibly for a briefing on the reasons for the corporate decision, Wright said. However, they left after a 45-minute meeting, still not knowing why the decision was made.

Following the meeting, "we had a kind of rump session and decided the gist of what Sarnoff had said was the division's cash requirements were too great and they didn't know where that kind of money could be raised."

The mistake was discovered subsequent to this meeting, he said.

Two Firm Offers

Wright then compared the offers to purchase RCA received from Mohawk Data Systems and Univac, noting these were the only two firm offers RCA received, although talks were held with nearly every mainframe manufacturer.

Mohawk offered to pay a combination of cash, some debentures and some convertible debentures that would have given RCA an equity position in Mohawk, he said. The offer was worth an estimated $80 million more than Univac's.

Mohawk's intention was to purchase the Computer Division intact, including all its facilities and inventory, Wright said.

Univac, on the other hand, offered to take only the installed based and its maintenance business.

"In my opinion, Mohawk's offer would have been in the best interest of the users as well as RCA, Wright said.

The First Boston Corp., Mohawk's investment counselors, vouched for the firm's financial stability at that time, he added.

Despite recommendations from Wright, Donegan and others who met with the firms that expressed interest in acquiring the Computer Division, RCA corporate officials signed with Univac.

High Production Costs

Wright, who had headed the Systems Development Division for less than one year when the exit announcement was made, testified two principal problems reflected on the firm's profitability. One which he had already begun to address was the high cost of manufacturing.

RCA's cost of production was 42% of revenues, he said, compared to 14% to 15% at IBM. At Univac, manufacturing costs as a percentage of revenues was 24%, while at Burroughs that figure was 21%, he said.

Wright attributed high manufacturing costs to three key problems. First, he said, RCA did not take advantage of automation in its manufacturing process the way IBM did.

Second, there was no engineering emphasis on manufacturing economy at the design stage, and third, no engineering effort was expended on building in new manufacturing economies after a product was already in production, he said.

Wright instituted value engineering to reduce costs and by September 1971 had reduced those costs by 8%. Further, he said, targets were also set that would have reduced manufacturing costs to 22% within five years.

The firm's second serious problem was the introduction of the RCA Series system to replace the Spectra series before the Spectra was fully amortized.

When the RCA Series became available, users began to exchange their Spectra systems for more powerful RCA Series systems. This had a negative effect on the firm's profit and loss picture, he said.

A returns task force was set up to help find some uses for the Spectra equipment that was beginning to fill RCA's warehouse. The Spectra, which was first delivered in about 1966 while Wright was still at IBM, was depreciated on a six-year straight line basis, he said.

RCA could not recover costs on systems leased for less than six years, he said.

FCC Rejects Dataspeed Tariff

By Ronald A. Frank
Of the CW Staff

WASHINGTON, D.C. – The Federal Communications Commission (FCC) has rejected AT&T's application to tariff the binary synchronous version of its Dataspeed 40 CRT terminal because the Bell device was "inextricably intertwined with data processing."

Objections to the proposed tariff, which would have taken effect on March 3, were filed by IBM, the Computer Business Equipment Manufacturers Association and the Computer Industry Association.

The commission said terminal-to-terminal communications such as those offered by earlier teletypewriters made by the Bell System companies "clearly was not the intent of [the Dataspeed 40] design or marketing," referring to the latest clustered version of the Dataspeed 40 terminal.

Under both the FCC Computer Inquiry and the 1956 Consent Decree with the U.S. Justice Department, Bell is restricted to providing non-DP communications services.

Responding to the FCC ruling, AT&T Vice-President Richard Hough said "we think the decision is just plain wrong.

"We intend to pursue all possible legal means to obtain a reversal of this decision," Hough added.

Judge Still Mum on AT&T

WASHINGTON, D.C. – Having received the views of the Federal Communications Commission (FCC) here on whether his court has the right to hear U.S. vs. AT&T [CW, Feb. 9], the judge assigned to the case has not yet decided whether the antitrust suit can come to trial at the U.S. District Court for the District of Columbia.

If Judge Joseph C. Waddy determines he and his court do have jurisdiction in this case, and the FCC should not decide whether AT&T has monopolized the telecommunications industry, then preparation for the trial – the discovery of documents and the interviewing of witnesses, suspended over a year ago until the question of jurisdication is resolved – can begin again.

When the judge will decide the jurisdiction question, no one knows. A spokeswoman for Waddy's office said that, even if the parties recommence discovery soon, "the case will still be in the preliminary stages, and there's no way of telling how long their completion will take."

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HORIZONS

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You'll notice we've left it a little vague. Since the people we're after are liable to be out there exploring the far reaches of sorting, we don't want the job descriptions to be too narrowly conventional.

Our present staff — of which we're very proud — came to us by some pretty diverse routes. Our president and chief salesman decided software was more exciting than nuclear physics. Our vice president-marketing crossed over the line from large data processors. Our service manager came to us with the ink on his diplomas scarcely dry. (He may not have worked elsewhere, but he's sure worked here.)

We don't discriminate because of race, creed, sex or previous condition of servitude. Send us a resume — don't call — even if you've worked for a very large computer manufacturer. After all, we're in the same business — sort of: They make the machines, we make 'em work better!

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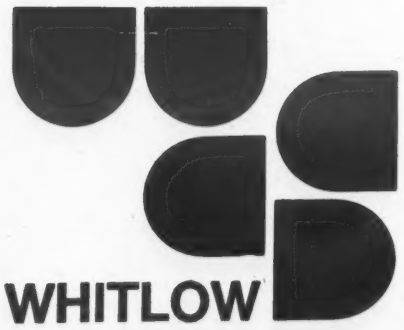

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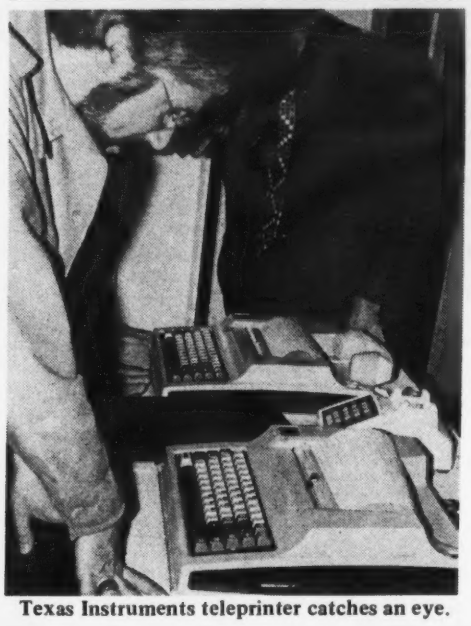
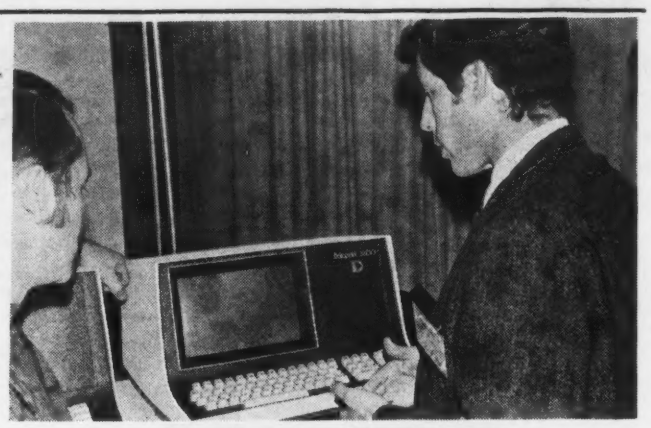


Texas Instruments teleprinter catches an eye.

Users check out insides of Honeywell Level 6.

Computer Caravan

A CW Photo Feature
By Ann Dooley



Pete Wilson shows Datapoint 3600.

Exhibit floor is scene of more than one conversation.

Paradyne introduces PIX II, which operates directly on IBM 360/370 multiplexer channel.

John Cullinane shows up-on film in the software gallery.

General Instruments Model 700 disk is center of attention.

Audit Software Seekers Urged to Buy From Vendors

By John P. Hebert
Of the CW Staff

WOBURN, Mass. – "There is no way to effect a changeover in one year to a complete in-house developed audit software system," Brian Bonner, chief auditor of the Boston Five Cents Savings Bank, told a Computer Caravan session here last week entitled "Audit Software."

An audit software system, once developed, should give a company's auditors independence from the DP staff; it should also offer flexibility and increase productivity, Bonner said.

For these reasons – and speaking from his experience with the problems encountered at South Shore National Bank (SSNB) of Massachusetts, his former employer – Bonner strongly suggested an audit software system be developed by an outside vendor.

The cost savings and other user advantages of using an audit software system at SSNB far surpassed any benefits of software developed in-house, Bonner said.

Special Problem

SSNB had a special problem that entered the auditing software picture, he said. The bank had auditors "without any experience in DP auditing and it had people in the DP departments that knew how – but didn't have the time – to help make the changeover."

Additionally, SSNB had branches in different locations and with four different computer systems – Burroughs, Honeywell, NCR and IBM systems, he explained.

The bank's holding company decided to form a computer subsidiary and planned to use the IBM system halfway across the state for the conversion to the audit software system.

However, Bonner said, "a basic tenet of auditing is that the auditor extract information independently of the computer personnel and programs.

"The auditing software system guarantees the group's independence from the computer personnel and the group members themselves," he said, explaining the advantages of a vendor audit software package.

Also, "if you write an in-house program, no other company will know what you're doing" and the company will be on its own, he said.

With an in-house program, only one person in the organization will know how to operate the system, there will be no library of routines and enhancements will be difficult to accomplish, Bonner said.

All these things, SSNB decided, were advantages of buying an audit software program. Up to 25 people were trained to operate the system SSNB opted for; there is a complete library of routines; and enhancements were to be made at no charge, he said.

And in SSNB's case with Cullinane's Culprit system, the bank obtained a user group membership, installation took very little time (but longer than the 15 minutes the vendor said it would) and the costs were much less over a three-year period than a system developed by the bank's staff.

However, the first-year cost of the system was $20,000 for the audit software system compared with only $15,300 for programmer time and a Cobol refresher cost, Bonner said.

"It looked like the in-house program would have been cheaper" than the audit software system at that point, but the costs changed over the next two years in favor of the vendor-supplied program, he noted.

At the end of the third year, the bank's cost projections for a system developed in-house were $45,300 compared with $26,000 for the software system, which included a renewal fee of $3,000/year, he said.

The in-house developed system's price projections didn't include maintenance, improvements or technical expertise. The audit software system, on the other hand, is "easily alterable by a nonprogrammer," he said.

At the time the system was implemented, 13 audit programs were developed in two weeks on the Culprit system, he added.

However, there is a certain amount of technical knowledge still needed by the staff of a company contemplating an audit software package, such as knowledge of Job Control Language (JCL), Bonner noted.

"I can't urge you enough to get an audit software package. It has been extremely valuable to us," Bonner concluded.

Attendees Reminded Useful Data Already Exists for Measurement

WOBURN, Mass. – A "considerable amount of useful data" is already available to almost any installation interested in performance measurement, according to Phil Dumoulin, a systems analyst at Blue Cross of Massachusetts.

Accounting data is a good place to start, Dumoulin told a Computer Caravan workshop on measurement software here last week.

The combination of SMF and Hasp, which many large IBM installations use to manage I/O operations, provides "a pretty good view of what application programs are doing," he said.

Other than that, he noted, there are "add-on" capabilities that can be built in-house or acquired from outside sources to enhance the value of whatever performance tracking is being done at a site.

One major source of useful software and "a whole range of information" for any installation serious about improving its operations is the various user groups already in existence, he said, citing in particular Share and the regional meetings of the Computer Measurement Group.

Share makes available a number of user-devised modifications to IBM software which can be extremely useful, but the support even beyond the software was the thing that appealed to Dumoulin.

He noted, for example, that one tape full of modifications – the so-called "Michigan mods" – has many routines, some of which are variations of one another.

They can be very difficult to implement, but Share also provides the names and addresses of users so a new installation can work with one that has already implemented some of the "mods," he said.

Such hand-holding may be a real necessity, he explained. "With store-bought packages, you may have some installation problems; with 'freebies' you're guaranteed to have them."

While software is available to collect, reduce and report utilization figures for most CPUs, interpretation of what the final figures mean is another problem, he said.

Many Software Products Bow

D.C. Show Dominated by Peripherals, Terminal Vendors

(Continued from Page 1)

C/300 and the Nova 3, are properly classed as minicomputers.

IBM's General Systems Division brought the corporation's 5100 to the exposition as well as the 3741 diskette writer, the 5103 printer and the 5230 data collection system designed for the manufacturing shop floor.

In a novel and well-received move, IBM provided a separate room as part of its exhibit with a film on the use of the 5100 and several of these desktop portable computers to give attendees direct, hands-on experience.

Software, Services

Most of the new products announced or shown for the first time came from software and time-sharing companies.

Pansophic Systems, Inc. announced the development of an interface designed to link Panvalet, a program management and security system, with Easytrieve, an information retrieval and file management system.

A user owning both of these proprietary utility software packages can use such an interface to allow Easytrieve to get at data stored on Panvalet without disrupting sensitive portions of the program management files.

Developed by the company in response to user concern over the privacy implications of accessing files governed by Panvalet and to its own desire to have users acquire both software systems, the interface will be hooked up with Easytrieve as an option.

As yet, the interface has neither price nor name but will be available to users in the second half of this month, a Pansophic spokesman said.

A few booths away, Cullinane Corp. introduced a software package designed to help companies develop affirmative action programs.

Called the Equal Employment Opportunity (EEO)-Affirmative Action Reporter, the package contains 70 reports including a series of goals and timetables to serve as a basis for implementation of such a program and is priced at $20,000. As with the Pansophic interface, this system was developed by Cullinane at the request of one of its users – the Wells Fargo Bank of San Francisco – and it operates on IBM 360/370 hardware.

Cullinane's Integrated Data Base Management System (IDBMS) was also exhibited at the Federal DP Exposition as part of Boeing Computer Services, Inc.'s (BCS) offerings for the first time.

In addition to making the Cullinane product available to its users, BCS made an initial exhibit of its financial package, called EIS/Executive Information Services, and announced Scope, a system for evaluating systems analyst, programmer and operator proficiency. Again, this last software package is intended to run on IBM 360/370 mainframes.

Finally, Tymshare, Inc. provided initial demonstrations of its integrated data base management system, Magnum. The system applies relational data structure techniques and its own data management language, according to representatives of the company.

Tymshare said users need only know their own applications requirements and can communicate with the system through a handful of English statements or by employing Magnum's data management language.

Terminal Products

Being shown for the first time at this show in the terminal realm were Tektronix, Inc.'s 4051 graphics systems and 400G-1 terminal with graphics capability. Hazeltine Corp. was exhibiting its Modular One terminal, manufactured with an Intel Corp. 8080 microprocessor and presently available to OEMers only for $1,425. And Quad Systems, Inc. presented its data transmission terminal – QSI Model 7300 – which sends digital information from magnetic tape over phone lines to another magnetic tape transport and starts at about $10,900.

Only one printer was being shown for the first time, by Houston Instrument of Austin, Texas. The Model 8230 is one of two members of the company's 8200 series line printers and was announced in January. Available in a 132-column width with a printing speed of 1,400 line/min, the device sells for $3,785.

One new modem was on display. Penril Corp. exhibited its 48/micro synchronous data modem for the first time. Operating at a single speed of 4,800 bit/sec or 2,400 bit/sec, the modem can, with optional features split its channel into two, sending and receiving at 2,400 bit/sec each, or it can interface with 4,800 bit/sec asynchronous terminal equipment.

Service Bureau Debut

One new service bureau made its first appearance at this trade show. Applied Graphics Corp. (AGC), just under way in Gaithersburg, Md., specializes in data reduction, computerized drafting, computer graphics, digital plotting and computerized mapping.

Eventually, the firm hopes to open offices in cities such as Houston, San Francisco and Los Angeles. AGC owns its interactive graphics system – Auto-Trol Corp.'s Series 7000 system.

CW at Federal Expo

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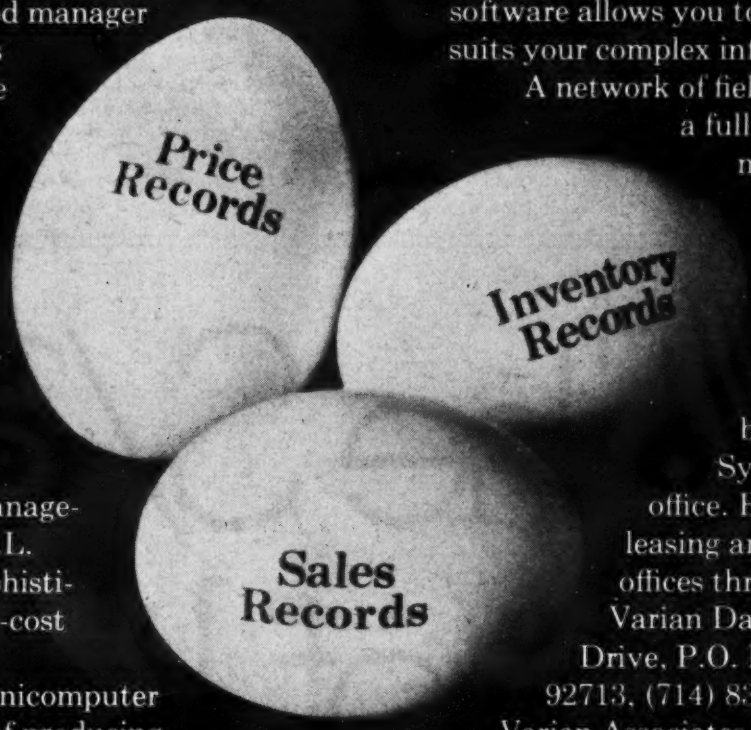

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Financial People Now Factor

DPers No Longer Sole Authority on Buying Equipment

By Kathleen P. Quinn
Of the CW Staff

WOBURN, Mass. – "The days of the DP manager as sole authority on an equipment purchase decision are gone forever," Louis Cataldo told a workshop at the Computer Caravan here last week.

DPers are now being "spoon-fed with a shovel to talk 'businessese,' " the Price Waterhouse & Co. consultant said.

The most important factor in an equipment purchase decision has become communication between the DPers who perform the technical evaluation and the financial people who decide the method of acquisition, according to Joseph Berns, also from Price Waterhouse.

Many vital factors "fall between the cracks" otherwise, a workshop participant added.

Checklist Needed

After analyzing the present system and establishing priorities for the system to be acquired, the DP people should prepare a checklist of system specifications, Berns said.

An evaluation of alternative systems must include an analysis – by either DPers or financial people – of the vendors' stability and reliability, he added.

The technical evaluation should include reliability and maintainability of the system. Speeds and timings should also be considered and their importance quantified.

All costs must then be analyzed carefully, with input from both DP and financial personnel, Berns said. Maintenance costs can add a significant amount to the total equipment cost in the long run, he noted.

Staff time to evaluate the system, interference with the work flow while the system is being installed and the machine time itself should all be quantified, he said.

Upgrade as well as downgrade restrictions or penalties are other things to check out before choosing a machine, Berns said.

Policy on pricing changes should also be discussed with each vendor, he said.

Electrical facilities at the DP center must be able to handle any system considered.

Mean time to repair and mean time between failures are definite items on any selection checklist, as are vendor guarantees, he said.

Lease/Purchase Decision

The second stage of the selection process – deciding whether to lease or purchase the equipment – begins after the technical evaluation has been completed and alternatives have been established, Cataldo said.

Because the approach to a lease/purchase decision is highly complex, it is imperative that both DP and financial people be involved and communicate with one another, he added.

A management decision on how long the equipment is expected to fulfill company requirements forms the basis for all purchase/lease decisions, he explained.

If a purchase is contemplated, timing of a cash outlay can have a big impact on a company, and this should be a consideration, he added.

The remaining value of equipment after several years is difficult to forecast, he said. No one is really sure when a system will become obsolete, but users should ask themselves whether they are "buying a white elephant," he advised.

"How the hell is it going to run?" should be the next question. Manuals, training and service can be important factors, especially if a lot of "hand holding" is required, he said.

CW at Caravan 76

Before buying, users should also consider whether there will be an adequate pool of programming talent around if the vendor leaves the market or discontinues the system.

The vendors' position on upgrades is important, too, he said. Also, if there is a design flaw, will it be corrected on the system at no cost? he asked.

Maintenance costs also affect the purchase decision, as do the method of depreciation, the investment tax credit and whether property taxes are involved.

Tax considerations alone are "a nightmare," Cataldo said.

Resale value at the end of the system's useful life and interst rates are other factors to be weighed in the decision, he said.

Corporate direction within the time frame the system is expected to serve the company are also basic considerations, Cataldo said.

For instance, if the company is planning a merger or an acquisition with a firm having its own DP center, its equipment needs could change drastically, he pointed out.

If a decision is made to lease equipment, matters of concern are who assumes shipping and installation costs, property taxes and maintenance costs, Cataldo said.

System integration and checkout responsibilities should be set, he added.

The user should also know about any termination penalties, break-in period charges and what happens if the system fails to perform as promised. Who is to provide engineering services is another point of negotiation.

Users should also be careful the contract includes a "no-substitution" clause so the vendor cannot substitute a machine with capabilities similar to the one ordered.

It should also be determined whether there are penalties for upward expansion – whether the user can extend memory capacity, for instance.

Whether the user or vendor claims the investment tax credit is another point to discuss, Cataldo said.

Difference in Terms

Long-term and short-term agreements should be studied as well as purchase options. Digital Equipment Corp., for example, has a deal in which the user owns the machine after leasing it for five years.

Cataldo described this as "a nice little deal – for DEC – since it commits the user to owning DEC equipment."

When deciding on the length of time a system should be leased, the user should know third-party lessors are usually willing to lease at a lower cost and are more flexible in contract negotiations, but the leasing time frames are usually longer, Cataldo said.

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Lower Costs, Much More Power Seen Coming for Minis

By John P. Hebert
Of the CW Staff

WOBURN, Mass. – "We should be seeing changes in the cost and structure and changes in the functions and reliability of minicomputers in the next few years."

These predictions were made by Eric Frey, president of Frey Associates, at a Computer Caravan workshop session here last week entitled "Minicomputer Projections Over the Next Five Years."

The cost of minicomputers has been declining steadily since the first generation of machines was introduced in 1965, at the same time, power has been increasing, Frey said.

Today, a minicomputer system can be bought for $80,000 with power capabilities slightly less than those of an IBM 370/145; for $200,000, the capability of a mini can exceed a 370/145, he said.

"Five years from now, minicomputers with 64K core memory and power greater than the IBM 370/135 will cost under $2,000. There are already machines on drawing boards that can accomplish this," he added.

"I personally believe the cost of a minicomputer system today will be the lowest it ever will be from a hardware standpoint," he admitted.

However, the cost of electronics will decrease – manufacturers "will just put more intricate patterns on a smaller piece of space.

"Memory chips of 64K have been announced in engineering experiments, which characteristically means that development will be two years away," Frey noted.

Another one of the main changes in minis will be in the area of software systems, he said, as minis become replacements for large mainframes and software systems.

Today, most vendor-supplied software is designed to run in less than 64K of core; in the future, larger minis will be needed just to run the software, he predicted.

CW at Caravan 76

"More and more memory will be needed because of the overhead of operating system software provided by the manufacturers," he explained.

Another generation of minicomputers can be expected in the next two years, according to Frey, because of these changes.

In addition, "more customer support from vendors and independents will appear over the next few years. Today, buy a mini and you're on your own. The vendor will come in and set it up and that's it," he said.

Frey pointed out that Digital Equipment Corp. is providing support to its users, "and this is why a Decsystem-20 costs $400,000 to $500,000 – but it is not an inexpensive minicomputer," he emphasized.

Changes in Micros

There will also be significant changes in microcomputers, according to Frey, who defined a microcomputer as a "minicomputer that is smaller and much cheaper."

Microcomputers, built around microprocessors that are just chips, "will appear in any devices which need logic to perform control functions," such as automobile diagnostic systems or telephones, because of the low cost of these devices, he said.

The use of microprocessors, Frey said, "will create a major revolution in the way computers are used in business."

Micros will become more inexpensive and more widely used – so much so, he said, that computers will no longer be just administrative tools automating "people-work."

Paradyne, Delta Among Vendors Unveiling Units

(Continued from Page 1)

A PIX reportedly eliminates teleprocessing software requirements and the need for a 370X-type device and simplifies the communications operation. It can interface directly with IBM I/O peripherals and the 3270 CRT, the firm said.

The PIX II system controller has a microprocessor incorporated in it with a 65K-byte storage capacity plus parity. Memory cycle time is 500 nsec.

The microprocessor contains 53 instructions with an average execute time of 2.5 μsec.

The system operates over a range of communications facilities, including dial-up lines, leased lines, wide-band transmission, digital networks and satellite transmission links.

Transmission speeds offered range from 4,800- to 9,600 bit/sec over half- or full-duplex lines; 19.2 kbit/sec in short-haul configurations; and up to 56 kbit/sec over hard-wire lines, the spokesman said.

A typical PIX system operating at 4,800 bit/sec with 300 card/min printer and 300 line/min printer costs $1,325/mo on a two-year lease. Maintenance is $320/mo, the company said.

A system including only two PIX II units and two Paradyne modems for 9,600 bit/sec operation costs $1,050/mo plus $120/mo maintenance on a two-year lease.

Bell or other RS-232-compatible modems can also be used in the system. The PIX II system is available in 45 days from Paradyne at 8550 Ulmerton Road, Largo, Fla. 33540.

CRT Debuts

Delta Data Systems Corp. introduced a stand-alone, user-programmable CRT terminal for interactive and off-line intelligent operations.

The Delta 4500 is available with up to 16K bytes of read-only memory (ROM), RAM and programmable read-only memory (Prom).

Up to 25 lines of 80 Ascii characters can be displayed in a 5 by 7 dot matrix configuration, a spokesman said.

Half- or full-duplex transmission speeds up to 9,600 bit/sec are available through EIA standard RS-232C I/O communications, the company said.

Programmable by User

Features of the 4500 terminal include a user-programmable communications interface, paging feature and protected data format.

The terminal is priced at $4,500 from the company at Woodhaven Industrial Park, Cornwells Heights, Pa. 19020.

Houston Instrument introduces two models in its 8200 series of line printers, designed for use with CPUs, terminals and other data systems.

Available with 80- or 132-column widths and printing speeds of 2,400- and 1,400 line/min respectively, the printers feature uncrowded characters and quiet operation, according to a spokesman.

Speed is said to be independent of the character mix or number of print positions utilized.

The Model 8210, a 2,400 line/min printer with 80 columns, costs $3,000. The 8230, with 1,400 line/min and 132 columns, costs $3,785 from the company at One Houston Sq., Austin, Texas 78753.

Atlantic Research showed a data circuit access module for its data patch system. The module allows the user to switch modems, terminals and ports for service restoral or diagnostic testing in communications systems.

The data patch module was designed to be part of an overall technical control center capability from the company. A typical patch capability for handling about 16 lines costs $1,200. Delivery is 90 days from Atlantic Research at 5390 Cherokee Ave., Alexandria, Va. 22314.

Tally Corp. showed a quiet enclosure for its T-1000 OEM printer. The unit costs $2,575 and will be available in the second quarter from the firm at 8301 S. 180 St., Kent, Wash. 98031.

DPers Urged to Take Initiative

(Continued from Page 1)

in, regardless of job title, he said.

Almost as a corollary, he reminded the group "selling is not a dirty word." Practice selling ideas at work, at lunch breaks and, if it seems worthwhile, after work as well, he urged.

Try different selling approaches and assess their effects, he continued, and prepare a resume – "on paper or in your mind" – from time to time to see how your career is going.

Education plays a role in a person's career, he said, but "it's a strange role." Formal education is often a criteria for opening doors, even though the subject matter of the degree may not be directly pertinent to the job. As a career develops, however, accomplishments count more than a person's degree, he said.

Picking up a phrase from Walt Disney, McMahon reminded the group "it's a small world. Contacts made – pro or con – will almost always come back to help you or haunt you."

In effect, remember that all the people you work with are also human beings, he added.

In concluding this part of his talk, he urged the attendees to "exercise your ego. If you don't believe in the product, you can't sell it."

To support their egos, DPers should maintain their own files of accomplishments in their personal lives, in work for their communities and in their professional careers, McMahon said.

Turning to a manager's view of career pathing, he emphasized that "real communication" with staff members is absolutely vital.

This should be on both a personal and technical level, he added, so the manager can help his employees develop their own career plans.

More than anything else, he said, the manager should not impose his views of what a career "should be" on the workers. When it becomes obvious the worker and the job that has to be done are incompatible, ties should be broken as cleanly and pleasantly as possible, McMahon concluded.

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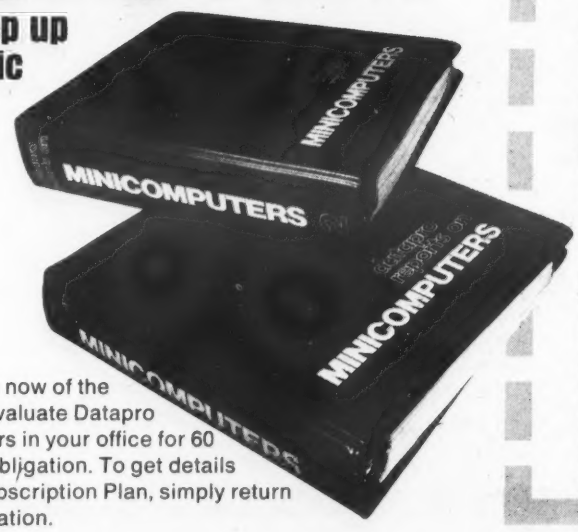

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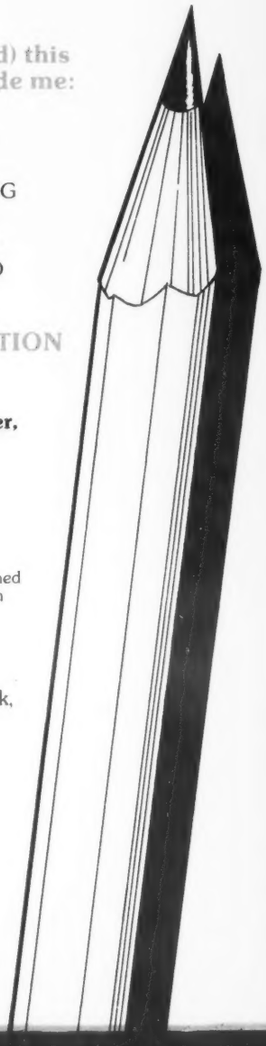

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Calendar

March 29-31, Las Vegas – **Data Processing Security Seminar.** Contact Program Director, Data Processing Security Seminar, 611 Ryan Plaza, Arlington, Texas 76011.

April 2, Commerce, Texas – **1976 Computer Users Conference**. Contact: Donna Hutcheson, conference coordinator, East Texas State University, Department of Computer Science, Commerce, Texas 75428.

April 5-7, Atlanta – **The Changing World of the EDP Industry**, sponsored by the Association of Data Processing Service Organizations (Adapso). Contact: Adapso, 210 Summit Ave., Montvale, N.J. 07645.

April 5-8, Chicago – **Design Engineering Conference**. Contact: Clapp & Poliak, Inc., 245 Park Ave., New York, N.Y. 10017.

April 7-9, Louisville, Ky. – **Educom Spring Conference**, "Implementing Cost-Effective Information Systems Now." Contact: Educom, P.O. Box 364, Princeton, N.J. 08540.

Societies/ User Groups

April 7-9, Washington, D.C. – **Second Annual Government-Industry ADP Conference**, sponsored by the American Institute of Industrial Engineers (AIIE). Contact: Department PR, AIIE Seminars, P.O. Box 25116, Los Angeles, Calif. 90025.

April 12-13, Chicago – **Challenges and Choices in Computing**, sponsored by the Chicago Chapter of the Association for Computing Machinery. Contact Julian Horwich, Abbot Labs, D-328, North Chicago, Ill. 60064.

April 21-23, Monterey, Calif. – **The Western Electronic Manufacturers Association (Wema) Spring Conference**. Contact: Lew Kasch, Tektronix, Inc., P.O. Box 500, Beaverton, Ore. 97077.

April 22-23, San Francisco – **Computer Law: The State of the Art**, sponsored by the Computer Law Association. Contact: Edward J. Grenier Jr., Suite 800, 1666 K St. N.W., Washington, D.C. 20006.

April 23-24, Middletown, R.I. – **Microprocessors**, sponsored by the Institute of Electrical and Electronics Engineers, Inc. (IEEE). Contact: Education Registrar, IEEE, 445 Hoes Lane, Piscataway, N.J. 08854.

April 25-28, Atlanta – **Sixth Annual NCR User's Conference**, sponsored by the Federation of NCR Users. Contact: George A. Ellis, Federation of NCR Users, P.O. Box 2055, Keltering, Ohio 45429.

April 26-27, Chicago – **First National Human Services Information Systems Conference**. Contact: Heidi E. Kaplan, information services manager, New York Management Center, Department 14NR, 360 Lexington Ave., New York, N.Y. 10017.

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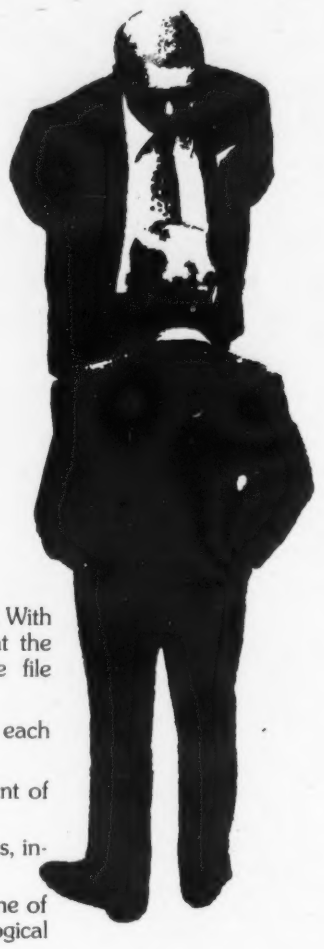

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With Distributive Approach

Bank Planning to Keep 10 Million Accounts Current

By Don Leavitt
Of the CW Staff

SAN FRANCISCO – The Bank of America has developed and is now implementing a distributive processing system to meet its requirement of having current information on more than 10 million accounts accessible around the clock from more than 1,000 statewide branch locations.

This approach became inevitable, according to John D. Foster, senior systems consultant, when a feasibility study three years ago showed a single integrated large-scale data base system wouldn't handle that kind of load with the reliability the bank had to have.

Instead of depending on a single large CPU with an extremely expensive backup "just in case," this distributive system entails segmentation and distribution of the application data bases and specialized processing among minicomputer-based modules, the consultant told a technical session at the IEEE Computer Society's Compcon 76 spring meeting here recently.

The hardware modules are linked through standard communications interfaces, simplifying the transfer of information among the specialized processors and the end users. Beyond that, all parts of each system are duplicated to protect the bank against failure anywhere in the system, Foster said.

The number of files, the size of the corporate data base, the volume of activity and time constraints were sited by Foster as factors that ruled out the single large mainframe approach.

There simply was no off-the-shelf data base management system that could be used to update the data base on a timely basis and also satisfy the bank's "voluminous" reporting requirements, he said.

The bank also foresaw a hazard in depending on a single mainframe, even if software could be found to support the required workload. "If that computer decided to take a lunch break, we'd be in a real jam. But a 'hot' standby large-scale computer was an expensive solution," Foster added.

Solution in Minis

Rethinking the problem, Foster saw minicomputers were coming down in cost while increasing in capability. So he envisioned a series of distributive processing systems, each made up of four minis and responsible for managing a segment of the "gigantic" data base.

Each of these segmented distributive systems could communicate with all the others so that when an inquiry or transaction against a different part of the data base came in, it would be handled automatically.

The linkage extends between the bank's two data centers – one here and one in Los Angeles – as well as between systems in the individual centers, Foster noted.

Initially these systems are intended to support inquiries and data capture on checking and savings accounts. Close to four million transactions must be posted to the 10 million accounts overnight and these are handled by a mainframe-based batch processing system, he explained.

In its turn, the batch system passes a copy of the updated data base to the distributive systems each morning so the inquiries and transactions coming in that day are matched against current information.

Two Pairs

Each system is made up of a pair of message-handling processors (MHP) which are linked to a pair of file management transaction processors (FMTP). These FMTPs access the data base segment for which they are responsible, which reside on four spindles of disk storage space.

If the account being sought isn't on that segment of the data base, the message is transferred to the appropriate module of the whole system. But the communications lines and the data base segments are planned well enough so that Foster expects at least 85% of all inquiries to be handled by the module which first receives them.

Just as the hardware units are duplicated within each module to protect against any machine failure, so are the communications links. All incoming communications lines, for example, feed into both MPHs, utilizing whichever one is free as the message is received, Foster said.

The MHPs and FMTPs are also linked with duplicate lines, but in a way that caught at least one member of the audience by surprise. Visually, the line pattern in this part of the system forms an "H" with double wiring between the MHPs at the bottom of the "H" and the FMTPs at the top and duplicate lines on the crossbar.

The linkage between the FMTPs and the disk storage is also duplicated, but in a more conventional way, forming a simple "X" in addition to the straight line links between FMTP and disk controller, Foster added.

Simplified Recovery

Built around General Automation minis, the individual MHPs produce long tapes so that recovery will be simplified if it ever becomes necessary. With that backup, even the failure of a disk unit would not be catastrophic, Foster said.

The previous night's data base could be reloaded and the transactions on the message tapes posted against it to bring the system back to a current status.

Still being refined to make sure everything possible is taken into account, the distributive – "not distributed; they're all in one place, but they allow the processing to be distributed" – systems are expected to move into production status later this year, Foster concluded.

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Fluid Leaks From Air Conditioner, Destroys Drug Company's Mini

NEW YORK – A Digital Equipment Corp. PDP-8 at the corporate headquarters of Pfizer, Inc., a pharmaceutical manufacturer here, was 50% to 80% destroyed when fluid from an air-conditioning system seven floors above leaked onto the CPU and corroded the wiring.

The PDP-8 was used as a remote batch to a Decsystem-10 located in the company's DP center in Groton, Conn., according to Blake Bidwell, director of systems for the firm.

The air conditioner was located on the 22nd floor of the Manhattan headquarters building and the processor on the 15th floor.

The incident happened over a weekend in January. No one was using the system at the time and no data was destroyed because it had already been sent to the main computer, Bidwell said.

"Apparently the prime ingredient in the fluid was ethylene glycol, and it managed to cause extensive corrosion," Bidwell said.

DEC estimated it would take six man-weeks of effort to repair the system, which the company had purchased four years ago.

Fortunately, a CPU was found at DEC headquarters to replace the PDP-8. The used processor was installed and running in two weeks, Bidwell said.

The firm considers the incident a freak accident imposed from conditions outside the computer room, but says it is looking into ways to prevent future repetition. An "umbrella" in the ceiling would be one such solution, Bidwell said.

Equipment loss was estimated in the $20,000 range.

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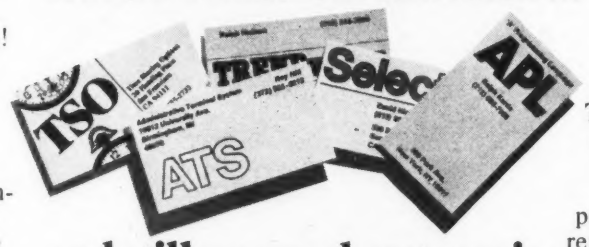

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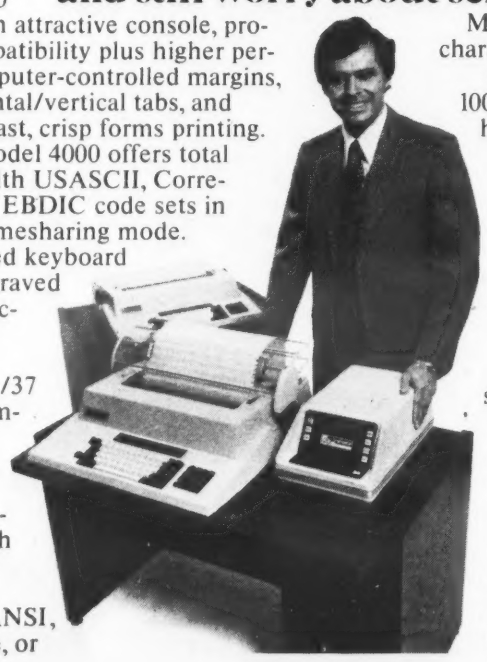

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Management Seen Doing Too Little to Curb DP Crime

By Molly Upton
Of the CW Staff

SAN FRANCISCO – Corporate managers could be doing more to prevent losses perpetrated with the aid of a computer, according to panelists at a session on "How Are Computers Being Used to Aid the Criminal?" at the IEEE Computer Society's Compcon 76 spring meeting here recently.

There is relatively little need to penetrate a system in a sophisticated manner since there are so many easier accesses, Donn B. Parker of Stanford Research Institute and Brandt R. Allen of the University of Virginia agreed.

Parker recommended tightening up the obvious areas, such as physical access, and protecting I/O from disclosure and modifications.

It is up to management to slow down developments in the computer area until the gap closes between auditing ability and applications that may be on the leading edge of technology, Allen said.

Too often management has abrogated its responsibility for the protection of the firm's assets, he said. Management has a right to – and should – slow down advances until it knows all procedures involving the firm's funds are secure, he said.

Improving Environment

Another area in which management should be doing more is making corporate DP areas a better place to work, Allen said. Business DP firms are generally not pleasant places to work in, he added.

Calling computer people somewhat of a "problem" because they're "different, difficult to manage," he said organizations are not dealing with problems of burnout and technological change.

Allen suggested the current method of making an auditor knowledgeable in DP is the backward way to solve the gap between state-of-the-art DP audting and the tasks to be done.

Since he believes computer people are born and accountants made, it would be easier and more effective to turn some DPers into auditors, he said.

Management should install control points between programming operations and data preparation and other phases, he said. The responsibility should be separated to ensure that a program, once written, is not updated without the proper procedures.

Firms have the ability to tighten physical security, but many are not doing it, he said.

Verification of on-line users is a problem from a technological view, but from an administrative view it is even worse, Allen said.

Operating systems are not a major problem for most businesses since the other areas are easier to penetrate, he added.

White-Collar Crime

Parker said he emphasized tightening the obvious security points because white-collar crime occurs where the people are. "White-collar crime varies inversely to automation," he said.

In the future, there could be a reduction in white-collar crime simply because there will be fewer people in these areas as automation takes over.

The average loss per case will rise astronomically, Parker predicted. In 1975 the average loss in bank cases, according to Federal Bureau of Investigation reports, was $19,000, whereas the loss involving DP was $450,000, he said.

Of 362 computer abuse cases, 147 occurred because of poor controls on manual input and output, he said. Weak or absent physical access controls were found in 46 cases; weakness in computer and terminal operations, 43 cases; and failure of business ethics was the cause in 41 instances.

Poor control of programs was responsible in 33 cases and lack of operating system access controls and integrity occurred in 24 instances.

In 120 cases, the scene of the action was in the data and report preparation facilities, Parker said.

'No Embezzlement Revolution'

Allen said "there is no revolution in embezzlement" despite the use of computers.

In the majority of cases, the deed is done through altered transactions, he said. The type of embezzlements are the same as years ago, involving disbursements, billing, payroll, inventory and receivables, he noted.

Allen estimated computer fraud could be approaching $100 million a year; much goes unreported by corporations, so it is difficult to estimate, he added.

Edmond L. Burke of Mitre Corp. said one method of devising a secure system is to implement a reference monitor at the kernel of a system.

This monitor would have an audit mechanism to provide accountability for each access by monitoring log-ins, length of sessions and CPU time used. It would be isolated so it could not be tampered with and should be designed and built so its correct operation can be verified, he said.

Mitre is building a security kernel for the Multics system and an operating prototype should be available in about five years, he said.

But then it will be up to the "fickleness of the marketplace" to determine whether such an item is in demand, he observed.

Although First Try Failed

Arpa Transmitting Speech by Packets

By a CW Staff Writer

SAN FRANCISCO – The Advanced Research Projects Agency (Arpa) network has been transmitting speech using packet-switching techniques, according to Robert E. Kahn of Arpa.

The agency has ended the experiment in this area and has accumulated a number of domain-specific programs for handling conversation to and from a computer, he told an IEEE Computer Society Compcon 76 session on data communications techniques here recently.

This leads to the question of whether one couldn't short-circuit the computer and substitute these capabilities for use of regular telephone lines, he said, adding he had no comment on this prospect.

Initial Failure

Initially the experiment was a total failure, he said, since good low-rate speech devices had to be implemented.

Kahn described the evolution to the decision on a satisfactory method of transmitting speech via packet switching. Delays occurred when experimenters used a Type 0 message, he said, which was delivered in the order that the source originated it.

There were flow control constraints placed on the transmission in order to ensure the recipient received the message in the same order. For instance, if a packet was missing, the system would halt it.

Also, there were limits on the number of packets that could be sent without receiving an indication that all previously sent packets had been received, he added.

Typically if one packet was slow in arriving, the delay between receiving all packets and sending more grew to be too great for use with speech, he said.

'Hot Potato' Approach

The experimenters then adopted the Type 3 message, which involved delivering the packets to the receiver as they arrived. This excluded ordering by the subnet, he said.

Kahn described this as the "hot potato" approach, indicating the network delivered packets as soon as they arrived.

Other elements in this approach were end-to-end subnet retransmission and pipelined transmission, he said.

In addition, researchers found they could relax the constraints that every packet be delivered. By speeding up or slowing down the recreation of speech, not every packet was necessary to make an understandable speech pattern, he said.

Let Host Decide

The designers let the host decide whether to discard the missing packet or to wait and reinsert it in its proper sequence, he said.

Under the original Type 0 packet scheme, only 65% of the packets were delivered within 1 sec, Kahn observed.

With the Type 3 sheme, 90% to 95% of the packets were delivered within .5 sec, Kahn observed.

As the data rate increased under synchronous transmission, the Type 3 results stayed relatively fixed, while Type 1 showed even poorer results.

Even up to 16K bytes the system didn't lose packets; they were just more out of order, he said. However, what was delivered was accurate, he noted.

TO:

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GERRY MILLER

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Editorial

Bottom of the Pit

In the democracy, each citizen can participate in the governing process through the right to vote. While many Americans question that theory and don't exercise that right, it is still meaningful – some elections have been decided by a very small margin of votes.

A case in point is last November's mayoral election in Flint, Mich., which was won by 209 votes out of 42,000 cast [CW, March 1]. Unfortunately, 746 of those votes are in contention because the computer cards in two voting machines were switched, causing ballots in those machines to be counted for the opposite candidate than the one chosen by the voter.

A judge is deciding whether the entire election should be rerun, whether just the two precincts involved should be rerun or whether nothing at all should be done.

The citizens of Flint favor the third option, according to an attorney involved in the case.

This attitude can be attributed to any or all of a dozen factors bandied about the country today – voter apathy, the Watergate syndrome, the feeling that "all politicians are the same," etc.

But the same attorney emphasized that if the results of the Flint election were allowed to stand, that attitude would be affirmed.

"There is so much apathy and distrust of elected officials now by the public, how could we tell the voter that we can't even assure the accuracy of his vote when he goes to the polls? That would really be the bottom of the pit," he said.

The court, however, doesn't carry the entire responsibility of ensuring that each vote will be counted accurately. The system used to count the votes is the bottom line and the punched card system draws a very shaky line in this case.

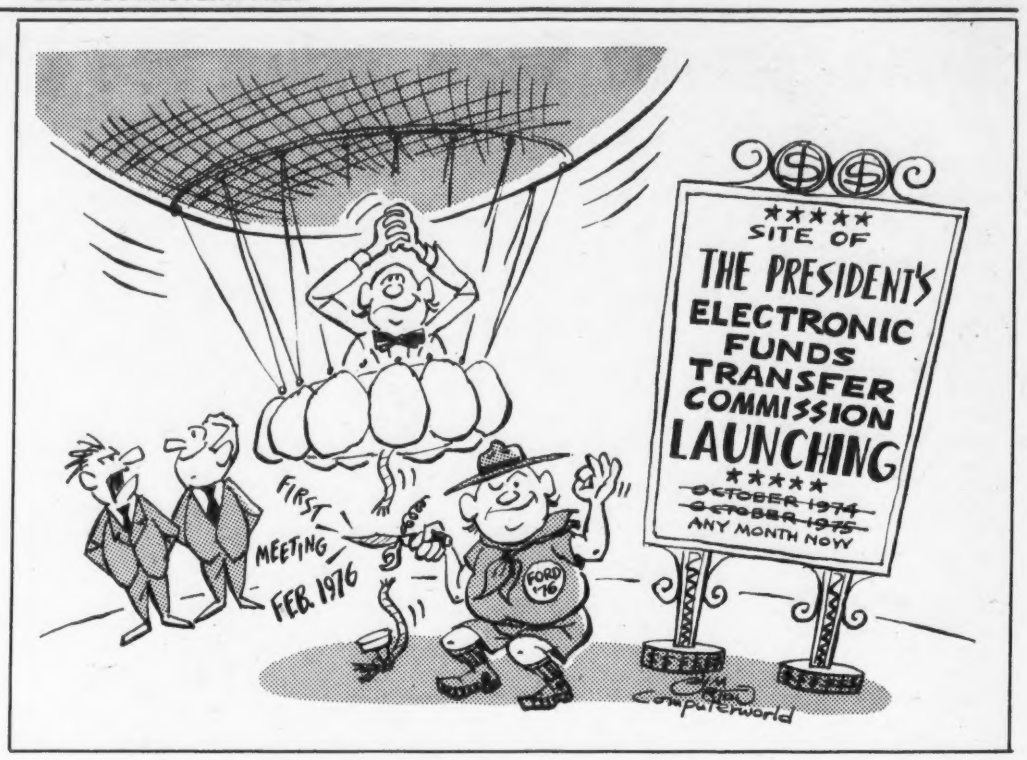
Flint's election error was supposedly a human error – someone accidentally switched the cards. That's why the error was caught; if such a switch had been done on purpose, it's unlikely that anyone would have detected it.

The Flint city clerk claimed this type of fraud would be very difficult to perpetrate, but there have been too many examples in the last few years that show the difficulty of a crime will not deter a candidate who is determined to win.

A system that is vulnerable to simple errors is even more vulnerable to fraud. And, according to a state election official, the punched card system is the "coming thing" in Michigan.

So perhaps every machine of this type should carry a notice for the voter: "Warning: This ballot may be dangerous to your constitutional right."

Have we really sunk that low?



'Well, Have You *Ever Tried Campaigning and Launching Balloons at the Same Time?!'*

Letters to the Editor

Honeywell Users Did Not Ask End To Software Fees—But They May

As chairman of the Honeywell Users Coordinating Council, I must advise you that "Users Ask HIS Software Fee End" [CW, Feb. 9] did not represent the true situation.

In the first paragraph the article stated the council "has adopted a resolution asking Honeywell Information Systems (HIS) to rescind its policy of charging for software on used machines."

This statement was totally false. The following is the actual statement sent to Clancy Spangle, HIS president:

"A topic of intense discussion at the recent meeting of the National Honeywell Users Coordinating Council, held at the Camelback Inn, Scottsdale, Ariz., Jan. 27-30, was the policy changes effected by HIS in 1975 concerning software licensing. The consensus of the delegates in attendance was negative toward these new policies. Pending official ratification by their respective executive boards, the delegates indicated the need for a formal resolution opposing these policies and an urgency to return to the policy and practices that were in effect prior to the implementation of the current restrictions on software transferability."

It must be made clear that William White did not act with council authority or knowledge. His statements were completely personal and definitely do not have the council's official endorsement.

John C. Smalling
Chairman
Coordinating Council

Honeywell User Association
Cleveland, Ohio

No Resolution Adopted

I would like to make it clear that no resolution was adopted by the Coordinating Council of the Honeywell Users Group nor was the council to evaluate Honeywell Information Systems' (HIS) response at its next meeting in July.

The topic did receive considerable attention at the meeting and a letter indicating such was forwarded to Honeywell.

The council was to discuss the respective executive boards' feelings on this matter in July.

It should be understood that my intent is not to indicate or imply Computer Management Association's (CMA) or any other user group's stand on this issue, but to make it clear that no resolution has been adopted by the council.

C.E. Wood
President

CMA
Findlay, Ohio

Meeting to Study Policy

As president of the Honeywell Users Group – Small and Medium Systems, I must clarify the position of this group. While any of us on the executive board *may* agree with Bill White's feelings, it is up to the membership at large to sanction any action which may be taken.

We will form a policy committee at our Denver session, March 29 to April 1, to study HIS policy and recommend action to the membership; the committee cannot, by itself, initiate action.

Mac McNamar
President

Honeywell Users Group
Small and Medium Systems
Los Angeles, Calif.

(Other letters on Page 16.)

Data Past

Five Years Ago
March 10, 1971

WASHINGTON, D.C. – The Department of Defense (DOD) told the Senate Subcommittee on Constitutional Rights it has amassed files on prominent civilians, ordinary citizens and various organizations; that it had destroyed some of these files; and that a new directive effective March 1, 1971 provided for the first time a DOD-wide policy on accumulation of data on those outside the military. The DOD's general counsel said the Army's surveillance was legal because there are no laws prohibiting it.

– – –

OAKLAND, Calif. – A 20-year-old University Computing Co. (UCC) employee was charged with grand theft after police armed with a search warrant raided a UCC service bureau in Palo Alto. Police said the programmer had tapped Information Systems Design's (ISD) Oakland computer to steal a proprietary program through unauthorized possession of sections of the ISD security code.

Eight Years Ago
March 13, 1968

DAYTON, Ohio – NCR Corp. introduced its Century Series of computers and a line of peripheral equipment. The Century's memory module has an 800 nsec cycle time.

– – –

PHILADELPHIA – Dr. Grace M. Hopper received the first Achievement Award given by the Philadelphia Section of the Institute of Electrical and Electronics Engineers for her "exemplary contributions to the science of computer technology."

They Never Learn

One of the curious things about the hardhat brigade, whether Pentagon officials or union leaders or state government bureaucrats or agribusiness executives, is the bulldog tenacity with which they return to the fray, no matter how often repelled and put down by the humanistic elements in our culture. It makes them most formidable adversaries. In a sense, the characteristic is selective – that is, people enter or excel at hardhat careers *because* of that grinding obstinacy.

Two examples came to me in the last weeks, in the privacy area. The first was in the private sector, and occurred at an interesting workshop held at the Miyako Hotel in San Francisco under the surprising auspices of the Livermore computer shop. It concerned itself largely with the security and privacy interactions of computer people and systems, and auditors and auditing. Good stuff in general, although pretty familiar to CW readers; I enjoyed it.

But right in the middle was a hardhat paper. With his head lowered, swinging his horns from side to side, snorting defiantly, the working manager of one of the major credit reporting operations challenged the auditor picadors and the computer matadors. He knew most of the audience had heard his arguments; he knew many of us (although probably not by any means a majority) had put aside productivity and efficiency as self-justifying in the Victorian sense. But he plowed ahead, shaking off the barbs; in fact, he wasn't attacked very vigorously – those who disagreed the most saw how little he would be persuaded, and sat back.

I rehearsed an argument I had used on the president of the French telephone equipment manufacturing ITT subsidiary, at a meeting in Bordeaux about five years ago: that large organizations, profit-making or otherwise, should apportion their resources between *all* the charges against the enterprise – raw materials, personnel, capital, innovation, customer protection, the natural environment, the social environment. But I dwindled off quickly; wrong audience. Unlike the GE nuclear experts who recently swtiched sides, Mr. Hardhat had no doubts. At least, I could uncover none.

Then, a couple of weeks later, this time in the public sector, came a second example. A county jury commissioner here in California announced plans to "broaden the base of jury selection" by using the state motor vehicle driver roster instead of voter registrations. There are 750,000 drivers in his county, he says, and only 455,000 registered voters. All he has to do is, gulp, reprogram his computer.

They never give up! All the effort, all the wide recognition, of the HEW report on personal records and government practices is ignored. Probably the commissioner doesn't even know its exists. But the DMV knows! Just a few months ago White Hats in the department – high-level White Hats – put out a fancy story that they never ever did such things, and besides, they intended to stop. Yet here is somebody, probably a lower-level Black Hat, encouraging Mr. Jury to invade the privacy of three-quarters of a million nonconsenting people.

In both cases, computer economics is central. The credit bureau could not dream of casting its net so widely, across so many millions of unaware victims, if the unit cost of incorporating and regularizing credit source data had not dropped spectacularly, and if remote access had not now become so inexpensive. The jury commissioner could not plan to sift the DMV rolls and eliminate nonadults and noncitizens and nonresidents, without data processing flexibility and economy. Even with punched cards, it would not have been cheap enough to consider.

We have to do what the Swedes do: set up watchdogs over federal, state, county, municipal *and* private data banks. I hate to do it; one more stuffy, form-generating, irritating bunch of bureaucrats. But truly, eternal vigilance is the price also of privacy. The hardhats never give up; they grind and grind and grind away, down in the cellar, behind the arras, up on the roof. They promise to be good. They say they'll tell us everything. They sacrifice a Nixon or a Haughton when big scandals erupt. But mostly, they just keep grinding!

So, organized surveillance is necessary – in a sense, pit one set of hardhats against the others. But it really isn't quite that bad; the bureaucrats who do Pure Food, and Privacy, and even, God save the mark, standards, are stuffy, and corruptible, and so on. But there are, across the board, more White Hats in consumer protection than in the Corps of Engineers – more people who care about people. And to award 'em one more medal, *they* learn. Slowly, perhaps reluctantly, they learn. The Establishment, the Bourbons, never do.

Herb Grosch

'Cures' Wrongly Directed

Faulty Assumptions Weaken Credit-Card System Design

One of the most difficult types of system problems to avoid is where some outside action that had not been anticipated wrecks the smooth running of a good system based on wrong assumptions.

Looking back to specifications does not solve the problem, while pressing forward with some presumed corrective action may result in blaming one set of users for the sins of someone else. And that is certainly a bad system.

The Taylor Report
By
Alan Taylor, CDP

An example of this type of problem came to my attention last week and is illustrated in the figure. Here, the delays in posting charges to credit-card accounts has resulted in "bunching" of delayed charges and made a mockery of the credit limits.

Then, when the real cause of the high-seeming balance was not appreciated, the card holder was terminated although he had paid and overpaid – by nearly $2,000 – all bills presented.

Credit limits are normally set at the amount a holder would need in a single billing period. This way, if his charging habits stay constant, he will always have some available credit (provided he pays his bills within the allotted time).

They do not, and perhaps cannot, take into account any build-up of charges that occurs from earlier months. The existence of such build-up of charges was not apparently thought of in the system design.

As a result, the design is based upon the concept that the credit limit should never be violated. If it is violated, the solution is that the holder is brought back into line or terminated. There is no consideration of whether it is his fault the limit has been violated.

In fact, however, this build-up of charges does occur. Airlines, while perhaps the major villains, are by no means the only culprits. There may be some tax reason for the delay in presenting charges that is occurring – I don't know. But the systems problem it presents is worth considering.

Limit in Use

Basically, a customer who pays his bill when presented expects to have credit for the time until the next bill. However, if some delayed charges are posted, they will effectively reduce the amount of available credit without the customer's knowledge, and a sudden credit violation can appear on the computer printouts, followed by the normal harrassment.

The problem is simply that the computer system does not discriminate between current charges (which should be kept to within the credit limit) and the delayed charges. Since the card holder does not know about these delayed charges nor control them in any way, these two types of charges should not be used in quite the same way.

The situation is aggravated through the inability to send out special billing statements to cover these delayed charges and other extraordinary items. Fixed billing cycles make good sense in most cases, but could with advantage be complemented by special bills to fill in the gaps of a system, such as the delayed charge gap.

Without these bills, delayed charges effectively result in the card holder having to choose between paying without being billed or losing an indefinite amount of credit for months on end.

The apparent solution to the problem is to ignore the real reasons for the situation and to hold the card holder responsible, notwithstanding the fact that he can't do anything about the situation.

This solution can contain the problem, but at the cost of letting it continue underground. I consider this to be an evasion, rather than a solution.

Due Date	Amount	Payment Made
Jan. 8	$565	$1,500, $935 without bills.
Feb. 8	679	1,500, $829 without bills.
Call Feb. 1	272	300 without bill
Call Feb. 15	?	500 without bill
Call Feb. 22	Terminated	

The history shown above indicates the attempts of one credit-card holder to cope with the effects of charge entry violations. Even though he paid some $2,500 without bills in less than two months, he was terminated without notice before the next bill was received.

Detecting this type of evasion is not difficult. When a system problem results in one user being blamed for the actions of someone else, there is often a tinge of hysteria in the complaints that can be found. And quite reasonably too.

An audit of the operation should watch out for such traces and then track them down to the root cause, as well as come up with some suggested approach which will meet the case.

In the current case, the root cause within the banks is that delayed changes are treated as though they were current charges for the purpose of defining credit-limit violations. There is little to support this use of late charges. They can normally be identified and should be segregated, for this purpose at least. Any losses that occur as a result of such delayed charges should also fall upon the people who delayed them and should not instead be used to inconvenience the card holder. So some solution is possible here – and, in most cases, this type of problem is being found while a system is in operation.

This being so, it is up to auditing to take on the responsibility of searching for and solving cases that are occurring because the original assumptions are incorrect. It may well be one of an auditor's most valuable roles. It should certainly be a routine check point in any audit.

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Letters to the Editor

Tip of the Iceberg

" 'Help Wanteds' Want Too Much Help, Often Overestimate Site's Real Needs" [CW, Feb. 23] pointed up an industry problem that is only the tip of the iceberg.

Our industry has no good tools that I know of to measure the kind of people a DP installation should be looking for and/or retain. Unfortunatley, a number of ways are available to obtain the types normally employed.

The most fascinating help wanted ad is one for a DP manager, director or vice president who has specific equipment, language and related software experience. Either that job has a false title or the people advertising are unaware of what a manager should know and be doing.

Another ad of interest is the one obviously desiring an above-average programmer or analyst, here again garbaged with very specific software/hardware requirements. This is analogous to advertising for a chauffeur with experience with a 1975 Lincoln, four doors, Champion spark plugs, radial tires and using Phillips 66 gasoline and Havolin motor oil.

Obviously, an experienced Cadillac chauffeur with outstanding mechanical ability would not apply.

It is my hope that personnel departments or computer hardware vendors write these ads without reviewing them with DP management. The alternatives are too horrible to contemplate.

Robert G. Frerking

Columbia, Mo.

Duplicates Difficult

I was amazed by William B. Simmons' article, "Functional Paragraph Names Key to Cobol Clarity" [CW, Jan. 26].

Duplicate paragraph names, like duplicate variable names, make a program difficult to read.

I have a program (written by Doug James, currently at Sanders) which takes a Cobol program and supplies ascending three-digit prefixes to each paragraph name. It then corrects each reference to this name within the program.

I have a similar program, obtained years ago from MIT, which performs a similar function for Fortran programs. I suspect there are many such programs available.

John P. Rudy, Manager
Operations Research
Raytheon Co. Missile Systems Division
Andover, Mass.

Getting Geography Straight

As a matter of interest to the rest of the world, Seattle and King County are actually located in the beautiful state of Washington ["King County Offer Still Open to Seattle Despite Sale of CPU," CW, Feb. 23].

Don't get us wrong – we're not mad because of the confusion; we love our sister state of Oregon. However, each of us wishes to be identified as we are.

The trouble with most Easterners is that they believe the Oregon Territory still exists and that Seattle is a trading post south of Sitka.

Ron Underwood

Seattle, Wash.

Backgammon Fan Needs Help

I need to improve my backgammon game drastically before retiring early to the Caribbean.

Do any of *Computerworld's* readers know of any programs that play backgammon? Or that simulate strategies for bearing off, doubling, etc.?

George Glaser

San Mateo, Calif.

Computerworld welcomes comments from its readers. Preference will be given to letters of 150 words or less. Letters should be addressed to: Editor, Computerworld, 797 Washington St., Newton, Mass. 02160.

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Performance Evaluation and Improvement

Saul Stimler, author of *Data Processing Systems: Their performance, evaluation, measurement, and improvement* will lead this two-day seminar on measurement techniques designed to save your installation money. As well as system performance at your own installation, topics covered include: Criteria for quantifying performance, pencil and paper analysis of a system, Benchmarking techniques, Realtime, Batch and interactive time sharing systems.

Cost for the seminar, including continental breakfasts and luncheons and all course materials is $250.

New York	Hilton	May 10-11
Chicago	Hyatt Regency O'Hare	May 17-18
Wash., D.C.	Stouffer's National Center Inn	May 24-25

Data Communications Course #1010 – Practical Data Communications Systems & Concepts

Dr. Dixon Doll, the nationally recognized teleprocessing consultant will lead this two-day seminar on the newest advances in data communications. The course covers areas like SDLC, HiD-LoD, DDS, newly approved major revisions to WATS, and the impact of Satellite Carriers.

Total Cost, including workbook, reference materials luncheons and continental breakfasts is $350. Additional registrants from the same company qualify for the reduced rate of $300.

Chicago	Hyatt Regency O'Hare	Mar. 15-16

Data Communications Course #1020 – Advanced Teleprocessing Systems & Design

Also led by Dr. Dixon Doll, this course is a follow-up to course #1010. Special emphasis is given to techniques that minimize operating costs in commercial data communications networks. This three-day seminar covers procedures, approaches, and algorithms for evaluating and cost-optimizing network operations. Total cost, including an extensive set of customized course materials, is $450. Additional registrants from the same company qualify for a reduced rate of $400.

Write for Spring Schedule.

Legal Tools for Computer Contracting and Protection

Under the instruction of Roy N. Freed, a nationally known lawyer, author and educator in the field of computer law, you'll learn how to increase your advantage in dealing with vendors that supply your installation. As well as practical discussion and review of your own contracts, subject areas covered in this 2½-day seminar include: Negotiations, Contracts, Warranties, Avoidance and resolution of disputes, Security, Fraud, Taxation, and Techniques for handling any transaction. Cost for the entire seminar, including continental breakfasts, luncheons and all course materials is $325. Additional registrants from the same company are charged only $275.

Chicago	Hyatt Regency O'Hare	May 5-7
Seattle	Airport Hilton	May 19-21
New York	Summit Hotel	Jun. 23-25

How to Increase Programming Productivity

John W. Brackett, PhD, Vice President of SofTech, Inc., will lead this two-day seminar for technical managers on the state of the art of Software Engineering. Under his direction you will learn how to: create more precise and visible analysis and design; reduce integration problems; improve software reliability; incorporate visible outputs into the software development cycle; increase programmer productivity; and improve programming management methods. Topics covered include: Structured programming; Top-down analysis, design, implementation; and Chief Programmer teams. Cost for the entire seminar, including continental breakfasts, luncheons, and all course materials is $300. Additional registrants from the same company are charged only $250.

Chicago	Hyatt Regency O'Hare	March 8-9
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On Pair of 370/158s

Planning Smooths Firm's Switch to MVS Environment

By Don Leavitt
Of the CW Staff

REDONDO BEACH, Calif. – A computer center at TRW's Defense and Space Systems Group here recently shifted to an IBM OS/VS2 multiple virtual storage (MVS) environment.

Everything is going fine and on schedule, but it took a lot of things coming together in just the right way to make the change a success, according to a trio of managers from the Information Systems Processing Lab (ISPL).

Performance Evaluation

The lab has a pair of 370/158s, one with 3M bytes of memory, the other with 2M, which will be upgraded to 3M in April. Along with MVS, IMS/VS 1.01 is on one of the CPUs while time-sharing option (TSO) is on the other.

They utilize job entry system (JES2) for shared spooling, and the users believe they have the first such system up and running in the Los Angeles area.

The lab is responsible for supporting the business-oriented DP within TRW's group here and in one or two other remote locations, Operations Manager Gene Coleman said.

Operating around the clock and throughout the year, the center provides facilities for on-line and batch financial reporting, engineering drawing generation, manufacturing support and purchasing.

ISPL personnel are not responsible for application programming. They are responsible for maintaining the operating system, the computer operations and real-time communications support, as well as the liaison required by the end users, Coleman noted.

MVS Potential

The potential with MVS is remarkable, Coleman said. While the early versions of OS/VS2 allowed up to 16M bytes of virtual storage to be addressed, regardless of how much real storage existed, MVS is designed to allow multiple 16M virtual storage address spaces, all on the same system and without concern for the size of real storage, he added.

At ISPL, the system is configured to support 10 to 15 separate address spaces, each potentially 8M bytes in size. As TRW's system is structured, 512K of virtual is the default definition of region size, and users typically request only 80K to 128K, Coleman added.

There are 100 to 120 interactive IBM 3270 terminals feeding into and getting information out of the system, and traffic amounts to 12,000 to 15,000 transactions from 7 a.m. to 5 p.m. every day, according to Bruce Arboit, manager of the real-time systems section.

Response Time

Response time dropped somewhat with the changeover to MVS early in February, but that was "pretty much what we expected," he said.

At first the system was "overinitiated," but Arboit chopped that back and now the response time is approaching what users experienced in the earlier "SVS" setting, according to the manager.

It took "considerable effort" to get the software organized and operational on schedule, starting with the basic fact that generating the operating system to work with IMS/VS differed from generating the system for the "TSO machine," Robert Koppelman, general manager at ISPL, said.

This was an example of a project that was handled the right way, he added. "Top management involvement" is a classic goal: In this case, it was real, continuing and positive, he said.

Project Plan

But the key factor was planning that went into the project plan ISPL worked out before any specific software work was done.

"We followed an engineering approach, laying out definitions of tasks, work packages, resources and time constraints," Koppelman explained.

Based on that plan, commitments were made and detailed planning went forward. As many as 11 people from ISPL worked on the project part time – "That was four or five people full time, effectively."

They were joined by one from Arboit's section and, in October 1975, by two operators who were committed full time to the project, the manager added.

IBM Participation

Beyond that, the "knowledge and participation of a contingent of people from IBM was "fantastic," Koppelman said. They found answers when ISPL needed them, he added.

As software problems were recognized, they were posted to a data base ISPL created under its own generalized information management system (GIM), also up and running on one of the 370s.

Each week, the problems were listed for review at an IBM/ISPL meeting. Status reports were given and priorities were changed if needed.

These meetings and the GIM logs kept any of the problems from "falling through the crack," Koppelman said.

The IBM personnel "went out of their way to help" whenever anything remained unresolved or ambiguous, he added.

Two weeks after the system was put into production status, the managers were hard-pressed to name any remaining problems. The changeover was "transparent" to the application programs except for some JCL changes, and they were expected.

Things are so smooth at ISPL, the team that put MVS on the system has begun tuning it. MVS is "an order or magnitude more stable" than the earlier OS/VS2, Coleman said. The new system recovery, for example, works as IBM said it would, avoiding several crashes that would have occurred under the older system, he added.

Package From Cullinane Produces EEO Reports

WELLESLEY, Mass. – Another in a group of products designed to assist Equal Employment Opportunity (EEO) officers in the development of an affirmative action program has been introduced by Cullinane Corp.

Its EEO-Affirmative Action Reporter is said to generate nearly 70 reports, including a series of goals and timetables to form the basis of an affirmative action program.

These reports represent both the current status of the organization and the areas where additional emphasis may be needed.

The product can plot both in numbers and in graph form the progress made and point out any problem areas to the EEO officer. Cullinane said.

Developed jointly by Cullinane and Wells Fargo Bank, the package also includes facilities for generating the U.S. government-defined EEOC reports, as long as the basic data is available in the user's files, the vendor said.

EEO-Affirmative Action Reporter is built on Cullinane's EDP-Auditor system and is written in Assembler.

It operates on IBM 360 and 370 hardware, interfaces with any commercially available data base and has the capability to access any type of computer file.

The package is priced at $20,000, which includes training and support, and can be obtained from Cullinane at 20 William St., Wellesley, Mass. 02181.

Computerware 'Tcup' Increases Throughput in OS Installations

WEST NEW YORK, N.J. – Installations in virtually any of the IBM OS environments may be able to increase both operating throughput and programmer productivity through the load-and-go facilities of The Complete Utility Program (Tcup) from Computerware Corp., the firm said.

Programmer-prepared control statements direct Tcup execution. These statements are free-form, utilizing relative positions and key words in lieu of strictly structured coding sheets. "Extensive" defaults are available for omitted parameters, further reducing programmer effort, a spokesman said.

The utility includes editing of the input parameters and feedback to the user so that corrections can be made promptly.

Once the control statements are validated, Tcup is capable of supporting multiple reports from one pass of a file, file reformatting with changes possible down to field level and selecting multiple subsets of records.

Arithmetic calculations on numeric data, selective printing of files concurrent with other operations and both "implosion" – the creation of one record from many – and "explosion" in which many records can come from one, are all supported by Tcup, Computerware said.

The utility also provides translation of codes according to user-defined tables.

Tcup functions under MFT, MVT, VS1 or VS2. The package consists of one main phase and two post close phases and operates in a partition as small as 48K bytes, the vendor claimed.

First-year maintenance on the software is included in the perpetual license fee of $3,500. Subsequent maintenance costs $150/year, the vendor said from 6040 Blvd. East, West New York, N.J. 07093.

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Users Plan Three Of Five Conferences Set for This Month

Five software conferences have been scheduled for this month, with three of them sponsored by user groups.

The second annual Florida Software Services and Users Researching Systems Together (Furst) meeting will be held in Lake Buena Vista, Fla., this week (March 8-10).

The purpose of the conference is "to create an exchange of ideas and information to promote the most efficient use of systems and improve overall bank data processing," the conference committee said.

Further information is available from Furst, c/o Florida Software Services, Inc., P.O. Box 2269, Orlando, Fla. 32802.

The Computer Information Management Co.'s (CIM) 1976 Users Conference is scheduled for Dallas on March 18-19. The theme is "All-Pro Datacom Users Conference '76."

For further information contact Kenneth A. Parker, president, CIM, 325 Oak Plaza Building, 3707 Rawlins St., Dallas, Texas 75219.

Software Calendar

University Computing Company (UCC) will host a UCC/FCS User's Group meeting for users of UCC's General Ledger/financial Control System in Houston on March 24-26.

System updates will be discussed and concurrent sessions and workshops will be conducted in specific areas of user interest, the group said.

Further information is available from Mary Vaughn at UCC, P.O. Box 47911, Dallas, Texas 75247.

The Conference on Data Systems Languages (Codasyl) will hold its 17th anniversary meeting in Washington, D.C. March 15-16. The purpose of the meeting is to review the organization's accomplishments and provide input for future work.

For further information contact J.L. Jones, chairman, Codasyl Executive Committee, 125 Spring St. S.W., Atlanta, Ga. 30303.

"Software Management: Defense Systems and Other Federal Programs" will be held in Washington, D.C. March 22-23 and in Anaheim, Calif. April 5-6.

The conference is jointly sponsored by The American Institute of Aeronautics and Astronautics (AIAA), the Association for Computing Machinery and the IEEE Computer Society's Technical Committee on Software Engineering.

Further information is available from the AIAA at Suite 1710, 444 W. Ocean Blvd., Long Beach, Calif. 90802.

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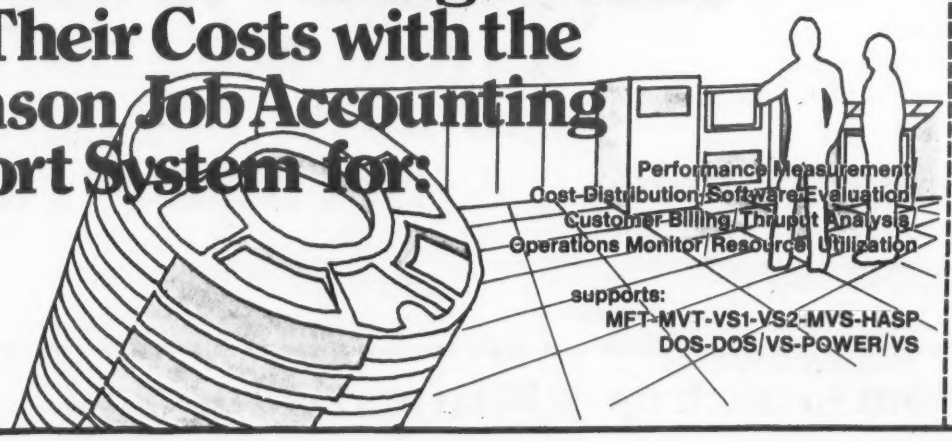

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Positive Changes Predicted

More Efficient DBMS Seen Coming in Next Five Years

By Don Leavitt
Of the CW Staff

SAN FRANCISCO – Many elements will go into making the next five years very active – and essentially positive – ones in the development and use of generalized data base management systems (DBMS), according to Prof. Anthony I. Wasserman of the University of California.

The systems will become more efficient in that time span, primarily because of better performance on secondary storage devices and the gradually increasing use of systems built around associative processors, he said at a recent IEEE Computer Society Compcon 76 session here.

Wasserman also expects more effective use of DBMS, particularly on the very large data bases that really hadn't been foreseen when DBMS were first being developed in the late 1960s and early '70s. In any case, he said, there will be an increasing use of DBMS, rather than file-based systems.

There will be a gradual merging of programming languages and data base operations, even though many languages today are still file-oriented. The work still being developed by the various Codasyl committees to link Cobol and DBMS were cited by the professor in this area.

Debate Resolution

Things should get easier for the data base administrators as well as the programmers, Wasserman said. There will be resolution of the debate between hierarchically organized data bases and those built on network concepts, he told the session.

Meanwhile, work on operating systems may very well be directed to command language features tied to DBMS.

Implementations of DBMS on small computers, already started, will be still another feature of the next five years' work on the systems. In particular, there will be considerably more research on distributed data base systems, Wasserman predicted.

The net effect of all this, he said, is that many more people and companies will develop and at least try to market many systems. DBMS "may well become as prolific as payroll packages," he said.

Earlier in the session, Wasserman outlined some of the approaches being considered to embedding data management operations in programming languages. This has to be done, he explained, because most current programming languages "work with the wrong abstraction of the data. They expect files."

Query languages overcome some of the problems, but there are some important drawbacks to these languages in their present form, he said. They tend to be weak in their computational ability and in their way they require users to express requests in well-structured forms.

There is a need to conform to syntactic and semantic rules "and that is often undesirable for the nonprogrammer," he added.

Embedding the query language within a conventional language overcomes some of those problems. But based on one experiment he described, Wasserman said other problems may crop up that nullify any serious gain from this approach.

Embedding other data base operations is possible, but several language features are needed to attain the goal of building reliable interactive programs which involve shared access to a data base. No single programming language appears to have all these facilities, he said.

Relational View

Describing another research project, Irving L. Traiger of IBM/San Jose told the meeting System R is based on a relational view of data. It is designed to relieve most of the problems associated with integrated data base systems, while still providing "efficient underlying support for other models such as hierarchic and network," he said.

Stressing that System R is "strictly a prototype project at IBM research" which may never become a product available to the general user community, he said it has several basic goals. The relational approach allows a gradual integration of applications into a data base environment, he noted.

Beyond that, Traiger said he hopes System R will support returnable access paths to the data, enable users to distribute the data base administration duties and permit the use of multiple programming languages and data structures.

If it reaches all those goals, changeover to a DBMS should be much simpler than it is today, he concluded.

Clarifications

Arkay Computing, Inc., developer of the Cobol conversion packages cited in "Packages, Standards Aid DOS/VS to OS/VS Switch" [CW, Feb. 23], is now located at 24 Manor House Road, Newton Center, Mass. 02159.

Mike Harvey, author of "Software Firms Must Manage Growth" [CW, Feb. 23], is president of the U.S. Group at University Computing Co. in Dallas, Texas.

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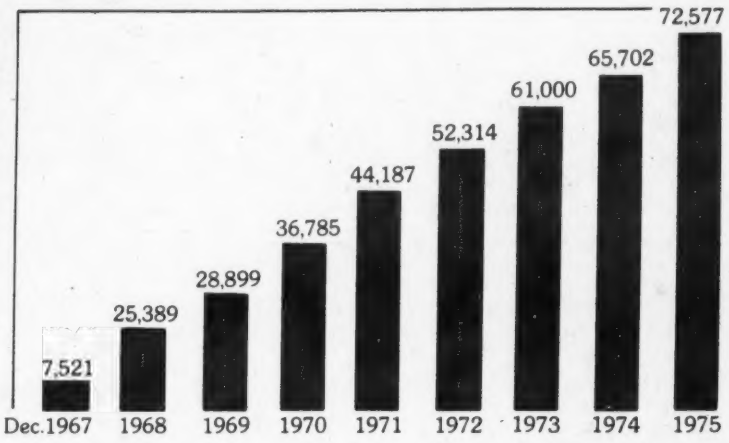

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'Deadline' Updated

McLEAN, Va. – An updated version of the Deadline package from Software Systems Corp. (SSC), Deadline III now has the ability to "drive" the scheduling of ASP3 and JES3 in an IBM OS/VS environment, the vendor said.

In one large-scale installation, better than 50% of its workload has been scheduled automatically without operator intervention, but with the combination of Deadline III and ASP3/JES3, SSC claimed.

The key to the successful merger of the systems is the ability of Deadline to generate the JCL "NET" and "MAIN" cards for ASP3/JES3, the spokesman added.

In its normal operation, Deadline schedules and controls the entire workload and resource usage of the data center including computer operations.

To do this Deadline has to resolve all dependencies, interdependencies, networks, "sociable" job mixes and resource contentions, in a prioritized structure.

Because JES3 requires the same type of information, the "marriage" of the SSC package and the IBM OS components is "most complementary and supportive," the vendor said.

The advantages of this "marriage" include the coordination of the JES3 function with the workflow of the total center and the ability to forecast and simulate ASP3/JES3 performance, the spokesman said.

Deadline III is distributed under permanent license arrangements for $24,500, the vendor said from 7900 Westpark Drive, McLean, Va. 22101.

In 360/370 Installations

'Quick-Trol' Helps Plan Projects

ATLANTA – A project management and resource control system for IBM 360/370 installations, Quick-Trol from Quality Data Products (QDP), Inc. aids in the planning of projects by providing timely information about actual performance and projections of future resource requirements, the vendor said.

Quick-Trol is a command-oriented transaction processor designed to assist in the allocation of both human and materials resources. Once a project has been defined, personnel, equipment and miscellaneous costs may be assigned to individual phases and tasks within the project, QDP said.

The package makes a distinction between projects that are in planning and those that are in progress. Projects that are in planning can be modeled so that alternative approaches to solving problems can be studied.

Resource Use Tracked

Once assignments are made, the system tracks use of the resources – usually on a weekly basis – and reports comparing actual to expected usages can be produced on demand.

Since Quick-Trol tracks time spent by personnel on the tasks and phases of the projects, management can rate employees on their ability to perform work assignments on schedule and within budget.

Project managers can be rated on their ability to perform reliable planning and to bring projects in as planned, a spokesman added.

The software operates under either DOS or OS, and time-sharing support is available, the vendor said. DOS users can acquire Quick-Trol for $4,600, and OS sites can get it for $6,600.

QDP can be reached through P.O. Box 76065, Atlanta, Ga. 30328.

EKW Package Shortens Debugging Time

GREEN BAY, Wis. – Stopchk from Edwin K. Williams & Co. (EKW) is designed to shorten debugging time in IBM DOS environments by allowing a program being tested under Stopchk's control to continue execution even if a program check occurs, the vendor said.

While there are other program check interruption monitors on the market, this one is said to have limits beyond which it will not let the test continue. Execution is allowed to continue until 10 program checks are intercepted, an erroneous instruction is repeated or an unrecoverable error is detected.

Without a test bed such as Stopchk, a program would be brought to an abnormal end (ABEND) whenever the first of any of those conditions were encountered. With it, many more problems can be identified in any one test session, the vendor said.

Passes Control to User

If execution cannot be continued for any of the situations monitored by Stopchk, it will pass control to the user's end of job routine to permit proper closing of disk or tape files – a necessity in the event printouts of those files are required to determine what went wrong, EKW said.

To assist the programmer in the analysis of test results, Stopchk prints out the hexadecimal location of the interrupt, the relative position of the interrupt within the user's program and the reason for the interrupt.

It also provides a "snapshot" of the erroneous instruction and the main storage addresses of the operands.

Data Exceptions

For data exceptions, the contents of each operand is displayed to allow the user to inspect the data fields, the vendor said.

Stopchk requires a DOS supervisor assembled with PC-YES in the FOPT macro. the routine used to develop the relative addresses shown on output have been tested with IBM's Assembler, Cobol D and ANS Cobol; the results with other compilers may be unreliable, EKW said.

The package is available for $200 from 519 Ninth St., P.O. Box 549, Green Bay, Wis. 54305.

'Progenitor' Generates, Maintains Application Programs On-Line

LOS ANGELES – Installations are said to be able to build on-line application programs quickly and to maintain them easily with Progenitor, a modular system from Computer Management Services (CMS).

Developed for CMS' own internal use, Progenitor produces Cobol source code to create the interface between any IBM 360/370 running under CICS and any 3270-like terminal, a spokesman said.

Upwards of 50% of the work in "any" individual application program can be produced on the basis of parameter cards fed into Progenitor, he added.

The three program generator modules in the package include map and table support, validation of on-line files and access methods into those files. The map and table generator produces programs that determine how data will be displayed on the CRT and control the temporary storage of data.

As much as 90% of programs such as these are created by the generator without any help from a programmer beyond preparation of the pertinent parameter cards, the vendor said.

Each of the three generators contains embrionic segments of code which provide models of program logic in a nonspecialized form. This allows the generator to select the correct segments and adjust them to the needs of a desired program, the company said.

Running in 512K bytes of memory, Progenitor can handle 10 to 15 terminals with as many as 50 application programs.

The package can be acquired for $25,000: a batch-processing program module generator and a typewriter terminal module generator are optionally available at extra cost, the spokesman said from 5550 Harbor St., Los Angeles, Calif. 90040.

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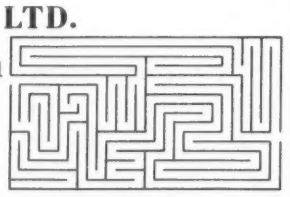

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COMMUNICATIONS

Scheduled to Start in Late '76

Canadian Network to Combine Circuit, Packet Switching

By Ronald A. Frank
Of the CW Staff

MONTREAL – Details of Canada's second packet-switched communications network were described during a recent talk given by G.F. Carleton, project manager for the Infoswitch network with Canadian National Railways and Canadian Pacific Ltd. (CNCP) Telecommunications.

The first Canadian packet-switched network to be announced was the Trans Canada Telephone System's Datapac net, scheduled to begin operations in mid-1976 [CW, Nov. 20, 1974].

The second is the Infoswitch net, which CNCP described as a nationwide hybrid circuit/packet-switched net scheduled to be available in the latter part of 1976, Carleton said.

The first phase of the Infoswitch network will include four switching nodes here and in Vancouver, Edmonton and Toronto. Initially a circuit mode called Infoexchange will utilize individually derived circuits dedicated to the speed of the customer.

Later a dynamic multiplexing technique using intelligent multiplexers will select the required bandwidth from a 56 kbit/sec trunk at the time of call establishment, Carleton said.

Infoswitch will offer two virtual call services, Infocall and Infogram, which will establish logical connections through the network. In the Infocall service, the net will carry out the packetizing functions; in the Infogram service, the data terminal will be responsible for the packetizing.

This means all data terminals on the Infogram service must be intelligent enough to implement a virtual call packet-mode standard, Carleton said.

Infocall will be available to both dumb and intelligent terminals, but it is intended primarily for the low-speed interactive user, he noted.

The network will packetize the user's data and allow an acceptable response time. The subscriber will essentially be unaware of the packetizing operation, although he will be billed on throughput rather than connect time, Carleton said.

Concentration Option

The Infocall service will include a computer concentration option designed to allow host CPUs with a large number of low-speed ports to communicate to a host CPU via medium-speed lines on which multiple simultaneous Infocalls have been established.

Using this capability, a user will require only one group of CPU ports to service the entire country, Carleton said. Normally a port group would be required for every city, and the low-speed data would be multiplexed with the link operating under Higher Level Data Link Control (HDLC), he explained.

Infocall will also provide point-to-point synchronous transmission on the basis that the framing data utilized in the standard protocols will be switched through the network and utilized by the user on an end-to-end basis.

Under the Infogram service the user will transmit and receive standard packets to and from the network. But the intellignet terminals will be able to establish multiple simultaneous virtual calls in the network.

Typically these terminals will be processors or intelligent controllers for a cluster of interactive inquiry/response terminals, Carleton said. A flow-control procedure will administer the flow of packets, and the address portion of the packet will be used by the net to associate the packet with the appropriate virtual call.

The synchronous frame in which the packets are carried will not be transmitted on an end-to-end basis, but it will be stripped off at the originating node and the packet will be transmitted on the network as a block of data.

This will allow protocol conversion such as data that is received under a subset of HDLC and delivered under a subset of binary synchronous communication protocol, Carleton said.

It will also allow the intermingling of asynchronous Infocall data and synchronous Infogram data over the same network host interface trunk, he added.

This in turn means a host CPU could simultaneously establish multiple calls over one link at 9,600 bit/sec and communicate both to asynchronous low-speed Infocall terminals and to Infogram packet-mode terminals, he said.

The Infoswitch network will enable existing terminals of all classes to utilize the net; single termination will operate in either circuit or packet mode. Infoswitch will interconnect its services with other national networks regardless of whether they are circuit- or packet-switched, Carleton said.

Traditional protocols will be maintained and a strict differentiation will be made between the call establishment requirements and the data transmission mode of operation, he noted. This will be done with "minimum penetration" into the customer's data terminal equipment, he said.

GE Extends Terminet Family With 90- to 340 Line/Min Units

WAYNESBORO, Va. – A family of line printers with print speeds ranging from 90- to 340 line/min has been introduced by General Electrics' (GE) Data Communication Products Department.

The Terminet 310, 320, 330 and 340 line printers use the same rotating belt technology as the Terminet 300 and 1200, GE said. The print rate varies with the number of printable characters per line and the size of the Ascii subset used.

Throughput rate for the 64-character Ascii subset is an average 340 line/min when there are 90 or fewer characters, according to the company. Minimum throughput is 231.8 line/min when printing characters in all 132 columns.

This includes one line feed per line, the firm added.

The printers have transmission speed capabilities of up to 60 kchar./sec in parallel configurations and up to 9,600 bit/sec in serial operations, it said.

The line printer series offers both front and rear paper loading capabilities, GE said.

Employ Mobius Design

The terminals employ a Mobius loop ribbon cartridge design. The cartridge is said to allow quick replacement; the Mobius loop ribbon feature extends useful ribbon life to 50 million characters, according to the company.

A test button located on the control panel provides for a checkout of printer action. A staggered or ripple test pattern will print continuously as long as TEST is activated, it said.

Fourteen LEDs are located on the out-

(Continued on Page 27)

Legal Net Gets Good Reaction

By John P. Hebert
Of the CW Staff

ST. PAUL, Minn. – A terminal network designed to help attorneys and researchers simplify the task of legal information retrieval is nearing the end of its six-month trial here.

West Publishing Company began Westlaw, a computer-assisted legal research system, last October, according to Arnold Ginnow, West's editor-in-chief.

Westlaw consists of a data base of legal case summaries prepared by the publishing company's lawyers and stored in an IBM 370/145 CPU here.

Lawyers use CRT terminals in their offices to call up summaries and opinions on any state court cases dating from 1967 and summaries of all federal court cases since 1961, Ginnow said.

The majority of users are large law firms or university libraries which have enough members to cost-justify using the system, he said, although other users presently include the Minnesota State Supreme Court, the U.S. Court House in Washington, D.C., and the Federal Trade Commission.

Researchers at the user sites type their inquiries into IBM 3275 CRT terminals and case summaries are displayed on the screen. Users can obtain a hard-copy report of the case summaries by pushing a key on the terminal and activating an IBM 3284 printer that is part of the system, Tom McLeod, Westlaw system coordinator, explained.

Westlaw offers a choice of two types of communications services depending on users' needs and desires, according to Fred Ihfe, manager of computer composition at West Publishing.

One of these is standard dial-up telephone service at 1,200 bit/sec through Bell 208A or 208B modems and an Anderson Jacobson acoustic coupler, Ihfe said.

The second type of service available to retrieve the information is AT&T's Digital Dataphone Service at either 2,400- or 4,800 bit/sec, he added. Bell modems are also used with the private lines, he added.

The information stream runs through an IBM 3705 controller before entering the "several data bases" of summaries housed at West's headquarters, Ihfe said.

The only problem encountered with the system so far is noisy telephone lines or modems, he said. However, subscribers have rendered "very positive reactions" to the system, Ginnow and McLeod agreed.

"It's a novel system that will be a big help to lawyers. Their time is crucial and Westlaw was designed to save time," McLeod explained.

(Continued on Page 27)

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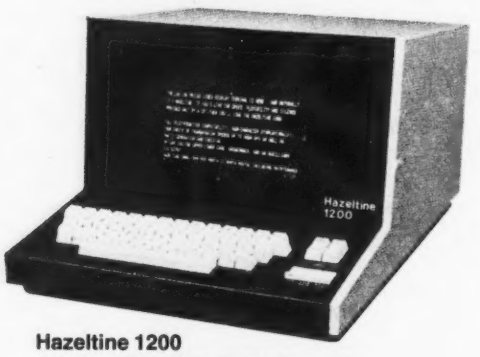

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ACS Method Smartens Terminals

SUNNYVALE, Calif. – Applied Computer Systems (ACS) has introduced a method which it said adds intelligence to existing dumb terminals.

The Basic Intelligence Unit (BIU) is located near the terminals which are to be provided with intelligence and connects to the units through RS-232 interfaces. One or a number of terminals can be serviced simultaneously, the company said.

The unit is a microprocessor-based system with a basic 8K random-access memory (RAM) which can be field-expanded to 64K, ACS said. Up to six IBM-compatible diskette drives may be used to provide over 3M words of storage at the terminal.

The BIU has programmable transmission rates from 110- to 9,600 bit/sec for synchronous or asynchronous operation, the company said.

Program aids are supplied with the BIU for reprogramming ACS' software packages include standard monitor, editor, debugger and assembler program aids, the company said.

Optional software packages available include a disk operating system, communications manager and Basic and business-oriented languages, it added.

A typical BIU configuration has 8K memory, two diskette drives and four I/O ports and comes with the standard ACS program aids. It costs $8,500 from ACS at 248 Sobrante Way, Sunnyvale, Calif. 94086.

Scrambler Handles DBMS Data

DALLAS – Datotek, Inc. has added a data scrambler which is said to protect data being transmitted by large dispersed data base management systems (DBMS) as well as data in CPUs accessed by remote terminals.

The DS-138 communications security system scrambles synchronous data at rates up to 9,600 bit/sec. A method of code generation utilizing multistep registers along with complex non-linear combining is employed to product statistically flat key stream, according to the company.

Featured in the data scrambler is the company's Mark II proprietary code generator, which is said to assure a high level of operational security.

"Expressed statistically, the code's cycle length would not be repeated until 10^{65} data bits had been transmitted; the number of code settings available is 10^{52}," a company spokesman said.

The DS-138 secures all bit-synchronous protocols, Datotek said. It is compatible with any EIA RS-232C terminal or modem via customer-programmable options.

No reprogramming of user software is required; operation does not add to central processor overhead and error rates are not adversely affected, the vendor claimed.

Self-Test Capability

The scrambler incorporates its own self-test capability, employs Cmos logic circuits for low power drain and automatically cuts off data if a failure is detected, the company said.

Both visual and audible failure warnings are provided, it added.

Two versions of the data scrambler are available for sale or lease. The DS-138, designed for half-duplex environments, is priced at $4,900; the model for full-duplex operations costs $6,400, Datotek said from 13740 Midway Road, Dallas, Texas 75240.

Westlaw Test Nearing End

(Continued from Page 25)

"More than 40,000 court decisions are reported each year, and the computer helps researchers find relevant material in that mass of information," Ginnow said.

A lawyer first types out on the terminal keyboard words or phrases he wants to appear in documents retrieved for display. The CPU locates and displays any document containing one or more of the words in that query.

As he proceeds, the researcher adds or deletes words to modify his search. After searching the file, he can review any or all of the retrieved documents, Ginnow explained.

Westlaw helped one researcher spot a decision he might have missed with conventional research techniques. The problem involved the right of an indigent to appointed counsel, and the lawyer entered the terms "indigent," "poor," "pauper" and "without funds," a spokesman said.

Those terms failed to retrieve a relevant case because in the relevant decision the judge used only the term "impecunious". The searcher discovered the case when a computer search was made of all cases classified under the general heading of "paupers", he said.

The system is unique, Ginnow said, because it features brief descriptive paragraphs, known as headnotes, for reported cases instead of entire opinions.

"The headnotes are concise statements and help the researcher review many documents quickly," Ginnow said. "Once he's found the relevant cases, a lawyer's search is limited only by his ability to frame questions for the computer," he added.

The cost of using Westlaw is $1,200/mo plus $2.50 for each query made to the system, McLeod said.

GE Extends Terminet Printer Line

(Continued from Page 25)

side of four different printed circuit boards, which are said to facilitate troubleshooting in the electronics of the printer.

Standard interfaces include serial, parallel, buffered and unbuffered; special interfaces are also available, the company noted.

Up to six-part forms – an original plus five copies – may be used. Horizontal spacing is 10 char./in. with six line/in. vertically.

The adjustable tractors can handle forms from 3- to 15-in. wide. Vertical format unit is standard equipment, GE said.

Commonality of parts (67%) in the Terminet belt printer family makes the series customer-modifiable so throughput can be increased, it said.

The Terminet 310, 320 or 330 can be upgraded to a 340 printer, the company added. Prices for the printers range from $3,900 for the Terminet 310 to $5,130 for the 340.

Deliveries on the Terminet 340 have begun; the 310, 320 and 330 will be available in the third quarter from GE's Data Communications Product Department, Waynesboro, Va. 22980.

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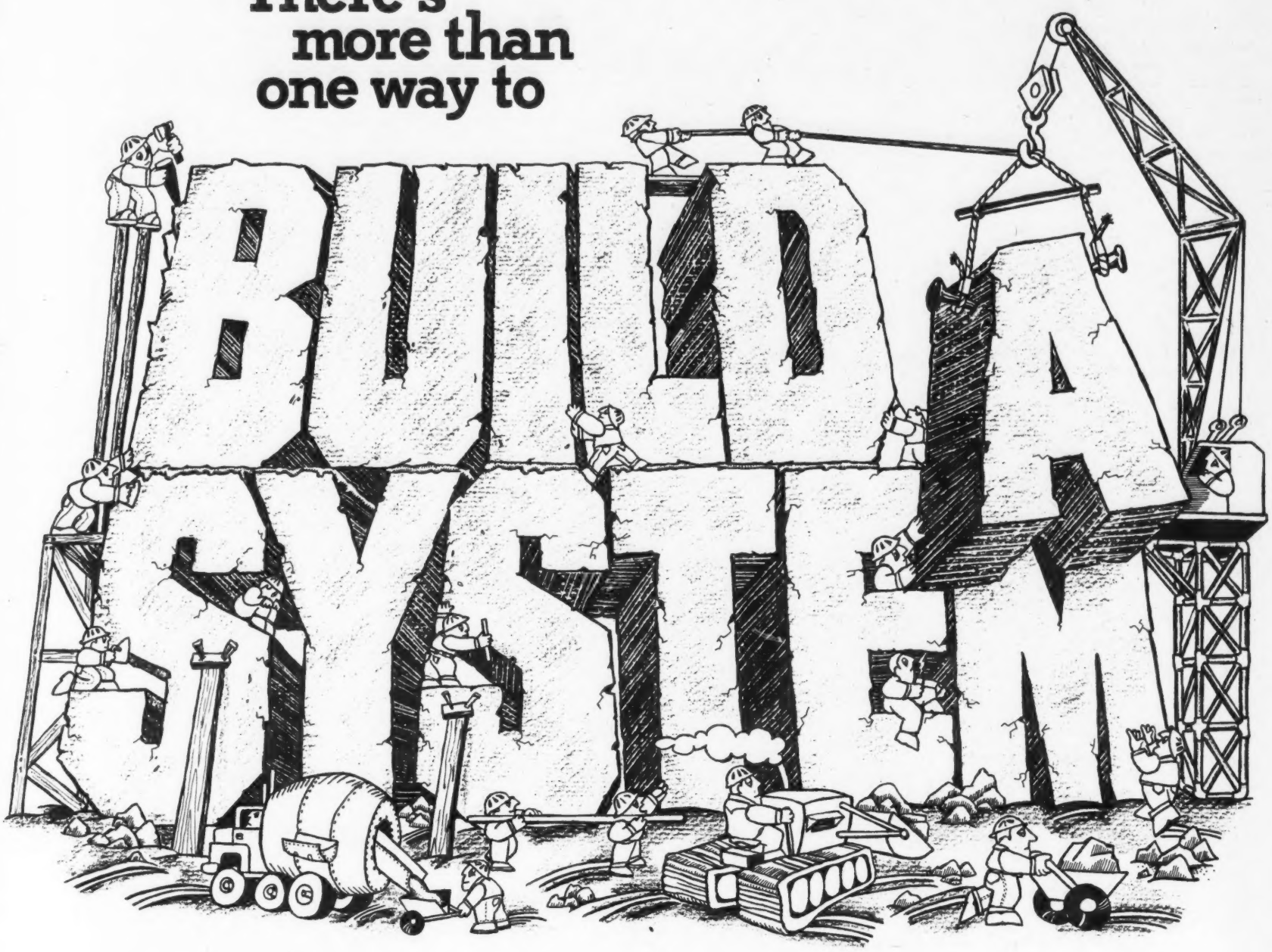

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These are averages. Complexity and size of job may increase or decrease the figures shown. We'd like to send you our **Systems Overview Handbook,** which details costs, rates and methods of working, including supporting data on typical in-house costs.

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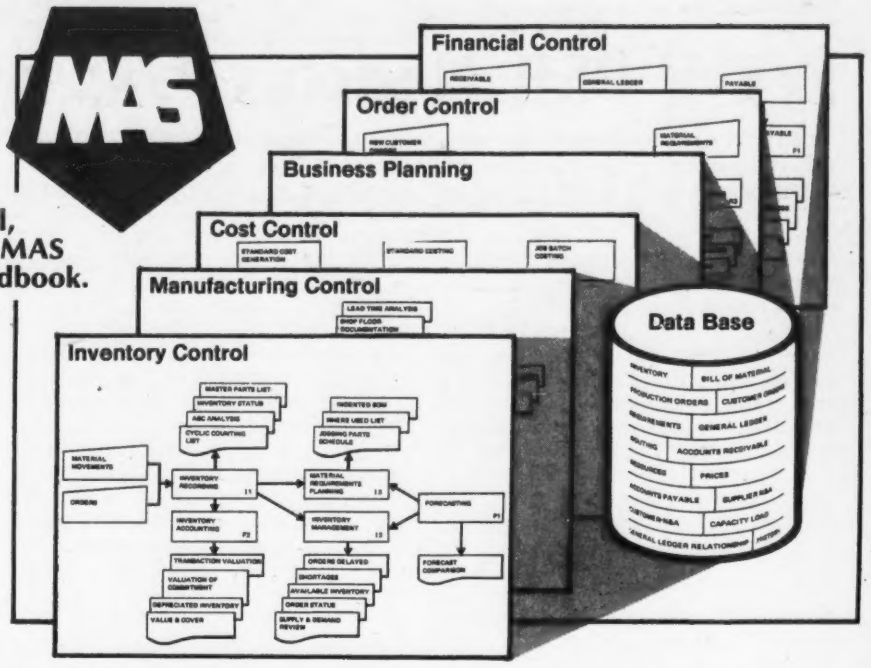
For detail, send for our MAS Overview Handbook.



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We're not preoccupied with cost reduction in the systems development process. We know that quality is more important as reflected in user satisfaction, operating convenience and economy, freedom from program errors and long term adaptability. As well, specialist skills, assured results and schedule flexibility may mean as much to the client manager. But a proper mix of $6, $4, $2 and $1 code can meet objectives without constraining system definition, while cutting expected cost by, say, half. And the perspective that permits this control and cost saving helps improve schedule and quality performance.

People and Professionalism

We seek the best people in the industry and encourage a disciplined, coherent method of working. Our Systems Development Methodology (SDM), for example, is used by some of the U.S.'s biggest corporations. And over 1500 client staff—as well as our own people—attended MMDS/Hoskyns courses in 1975 (on Systems Analysis, Program Design, System Management and Business Applications).

For more on SDM, send for the Systems Overview Handbook.

SYSTEMS DEVELOPMENT METHODOLOGY
IMPLEMENTATION TASKS: SKELETON SCHEDULE

ACTIVITY NAME	1	2	3	4	5	6	7	8
MANAGE AND CONTROL								
Documentation Review								
Implementation Plan Completed								
Personnel Assigned								
Team Orientation and Meetings								
Implementation Plan Revision								
Schedule and Budget Reviews								
Progress Meetings and Reports								
Personnel Performance Reviews								
CSD AND PROGRAMMING PHASES								
CSD Plan Completed								
CSD Progress Reviews								
CSD No. 1 Completed and Approved								
CSD No. 2 Completed and Approved								
Programming Plan Completed								
Programming Progress Reviews								
PROCEDURES AND INTERNAL TRAINING								
Complete Clerical System Outline								
Design and Write Interim Procedures								
Design and Write Clerical Procedures								
Design and Write Data Entry Procedures								
Design and Write Data Control Procedures								
Data Control Training								
Data Entry Training								
Design and Write Operating Procedures								
Operator Training								
CUSTOMER EDUCATION AND TRAINING								
Plan Education Program								
Clerical System Education								
Management System Education								
Monitor Customer Preparation								
FILE CREATION AND CONVERSION								
File Data Investigation								
File Creation Plan								
File Creation Procedures								
Skeleton File Creation								
Completion of File Creation								
File Validation								
FACILITIES								
Plan Facilities								
Order New Equipment								
Install New Equipment								
TEST VERIFICATION AND ACCEPTANCE								
Plan Acceptance Test Procedures								
Acceptance Test Procedures								
Prepare Initial Test Data								
Enhance Test Data								
Internal Acceptance Test								
Program Testing Completed								
Job Control Procedures Completed								
Customer Validation of Test Results								
Customer Acceptance Test								
System Cut Over								
Customer Acceptance and Handover								
Post-Installation Documentation								

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A Modest, Careful Approach

In ten years of building systems, our objectives have remained unchanged: to provide what our client wants; to work carefully and reliably; to work economically. Ultimately our success depends on sound product engineering. Investment since 1966 in software technology has resulted in our "Master Series" (modular programming test harnesses, table processors, data management languages) of software tools. These packages have been commercial successes in their own right with 100 in use worldwide.

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We've completed over 1000 assignments in Systems Development, Project Management and Technical Consultancy. A major part of our work has involved direct management responsibility for implementation. For example, we carried complete management and technical responsibility for the provision of systems and application software for one of the largest real-time systems in Europe. The network of 800 terminals, with peak traffic of 50,000 messages per hour, is driven by twin Burroughs 6700's.

Business Systems Expertise

Our people are just as likely to be engineers, accountants, or marketing experts as computer professionals. It helps in running our own business; and it helps in dealing with clients, that we understand the realities of business life, as well as the technicalities of systems development. This attention to business systems expertise and business-like performance is reflected in our unique range of off-the-shelf Modular Application Systems. Built in 1967 with Version 2 released in 1973, over 500 of these tailorable business systems have now been installed. The client gets a system to his exact specification, proven performance, and major cost reduction. We get a trouble free life and high margin. The only reason they sell so well is that they fit the planning and control needs of businesses: and the reason they *fit* so well is that they were designed and built by people who specialize in business and business systems.

For More Information: We'll gladly send our Overview Handbooks. Please contact Dick Nemerson at MMDS Headquarters, (301) 823-1600, 300 East Joppa Road, Baltimore, Maryland 21204. Please let him know your particular interest. We'll respond by return mail. We look forward to hearing from you.

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Penril PSH Modems Transmit Data Limited Distances

ROCKVILLE, Md. – The Data Communications Division of Penril Corp. has introduced a series of short-haul modems designed for limited-distance transmission of data.

The PSH series includes both synchronous and asynchronous models which operate at speeds up to 9,600 bit/sec and high-speed models which operate at 19.2- to 230.4 kbit/sec, the company said.

Features include digital and analog loopback circuits, self-test diagnostics with LED status indicators on the front panel and a line equalization capability without need of external test equipment.

Test equipment is not required to install the modems, Penril said.

Six Models

Six models are available in the series – one asynchronous and five synchronous modems – all operating in half or full duplex.

These include the Model PSH 96A, which operates asynchronously at data rates from up to 9,600 bit/sec, and three single-speed modems with speeds of 2,400-, 4,800- and 9,600 bit/sec.

Also offered are two modems with switch-selectable speeds of 2,400- and 4,800 bit/sec and 2,400-, 4,800- and 9,600 bit/sec.

Depending on modem speed and network wire gauge, the modems are capable of transmitting digital data up to 35 miles, Penril said.

Single unit prices of the low-speed modems range from $150 for the asynchronous PSH 96A to $760 for the PSH 24/48/96 switch-selectable synchronous model, a company spokesman said.

Faster Units

Faster units that operate at 19.2-, 40.8-, 48-, 50- and 230.4 kbit/sec complete the product line and cost from $800 to $1,800, he said.

The PSH 230.4 is said to offer rapid data transfer with reliable error rate performance. It is suited for applications where large amounts of data must be transferred in a small amount of time to reduce computer usage time, the vendor said.

The PSH 230.4 is a synchronous modem designed for full-duplex operation over four-wire shielded, twisted pairs or dual video coaxial cables. The unit is supplied as standard with Bell-type 301/303 high-speed current interface, Penril added.

Operating Distance

Operating distance is up to five miles over coaxial cable or up to 2-3/4 miles over shielded, twisted pairs.

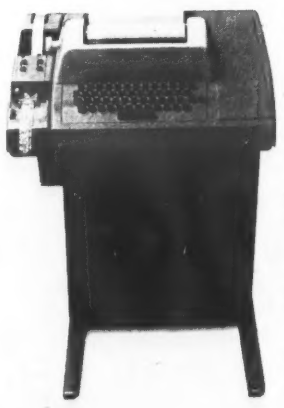
The modem employs coherent, differentially encoded biphase modulation.

Features include loopback circuits for both the digital (interface) and analog (line) circuits, 63-bit test pattern generator for error testing of the modem and line, front panel meter for monitoring signal quality, line equalization and single-card construction, the company said.

Installation and system testing does not require any external test equipment and can be performed by nontechnical personnel, it said.

The PSH 230.4 is priced at $1,800, according to a company spokesman at 5520 Randolph Road, Rockville, Md. 20852.

"Then it's agreed. We put the good-looking terminal up front in the customer area, and the Teletype model 33s back where the work gets done."



The Teletype® model 33 is the standard of the industry because it delivers outstanding economy, reliability and versatility in a wide range of applications. From message communications to computer input/output. On switched network as well as private-line systems.

For more information about the model 33, write or call: Teletype Corporation, Dept. 32 W, 5555 Touhy Ave., Skokie, Ill. 60076. Phone 312/982-2000.

TELETYPE

Teletype is a trademark and service mark registered in the United States Patent and Trademark Office.

T/S, Business Users Get Keyboard Printer

SUNNYVALE, Calif. – Anderson Jacobson, Inc. (AJ) has introduced a keyboard printer terminal aimed at time-sharing and business DP applications.

The AJ 832 utilizes a daisy-wheel print mechanism and is said to provide capabilities and features not found in other keyboard printer terminals.

Some of the AJ 832's standard features are 30 char./sec throughput on "average English text," a 256-character buffer memory, automatic print intensity adjustment, an expanded programmable numeric pad, switch selectable data rates, and plotting.

The standard model sends and receives using Ascii code.

Optionally, the terminal can be supplied with a 45 char./sec data rate, IBM EBCD and Correspondence codes and a selection of pin-feed platens or a forms tractor for forms handling, the company said. An Ultraplot mode feature provides high resolution X-Y plotting at approximately twice the speed of the standard plot mode, AJ said.

The AJ 832 costs $3,600 or $165/mo on a one-year lease from the firm at 1065 Morse Ave., Sunnyvale, Calif. 94086.

MDS Offering RJE System As Special Purchase Option

PARSIPPANY, N.J. – Mohawk Data Sciences Corp. (MDS) has offered a communication terminal system as a special purchase option.

The MDS 2405-1 Remote Job Entry (RJE) system consists of a programmable processor with 16K memory and a communications controller capable of transmission speeds from 600 bit/sec to 56 kbit/sec, the company said.

A 400 card/min reader and a 300 line/min printer and software are also included in the system, it added.

The software offered with the configuration includes four communication emulators: IBM 2780, 3780, 360/20 Hasp and Honeywell Gerts, MDS said.

Magnetic tape drives as well as other peripherals are available for the 2405-1 system at additional cost.

The working configuration, with software, can be purchased for $15,000; MDS will service and maintain the basic system at a cost of $300/mo, it said from 1599 Littleton Road, Parsippany, N.J. 07054.

Paradyne Cuts LSI Prices

LARGO, Fla. – Paradyne Corp. has lowered the purchase price of the LSI-9600 modem by 10% and has offered modems in the LSI series at lower monthly leases.

The switch-selectable LSI-9600 now costs $4,500, with a lease price of $135/mo, according to a company spokesman.

The LSI-4800 and the LSI-7200 modems lease for $90/mo and $130/mo, respectively, from the firm at 8550 Ulmerton Road, Largo, Fla. 33540.

Bits & Pieces

Wright Line Portable Unit Punches 80-Column Cards

WORCESTER, Mass. – A portable data recorder capable of punching up to 11 columns of numeric coding into a variety of standard tabulating cards (51-column, 80-column, two-card sets) has been introduced by Wright Line, Inc.

The recorder, which is said to be environmentally protected against oils, dust and continuous vibration, provides "precise" registration of the card and is equipped with interlocks to assure punching is done completely, Wright Line said.

Numeric information is coded using 11 slides which are positioned to display the number desired for each of the columns. Punching is then done with a single stroke, the company explained.

The portable data recorder can be individually configured to a user's needs, Wright Line said. It costs from $300 to $450 depending on options from the firm at 160 Gold Star Blvd., Worcester, Mass. 01606.

Units Make Copies on Plain Paper

LAKE SUCCESS, N.Y. – Two microfilm enlarger printers from Canon, the NP-Matic Printer 450 and Printer 200, are said to be capable of making positive copies from negative originals.

A selection switch allows users to choose paper size, either 8-1/2 in. by 11 in. or 11 in. by 17 in. Number of copies desired can be preset, up to 99, producing each copy every 8 sec, Canon said.

The 150mm by 200mm finder screen lets the user position copy and examine its size and legibility, Canon said. Paper is fed from cassettes with 400-sheet capacities.

The Printer 200 costs $9,950 and the Printer 450 slightly less from the firm's Micrographics Division, 10 Nevada Drive, Lake Success, N.Y. 11040.

Allen Has Microfilm Processor

MILFORD, Conn. – The F-10S microfilm processor from the Allen Products Co. is a compact unit designed for archival quality film processing which can process both microfiche and traditional source document film, the vendor said.

The F-10S can process 16mm and 35mm source document film and 16mm through 105mm computer output microfilm, according to the company.

The machine features daylight operation and loading, Allen said.

The F-10S costs $8,900 from Allen at 180 Wampus Lane, Milford, Conn. 06460.

After Eliminating Keypunches

OCR Saves Insurance Firm $16,800/Mo

NEW ORLEANS – An insurance firm here estimated it is saving $16,800/mo by using an optical character recognition (OCR) scanner system rather than keypunches to capture data from Medicare claims.

"Our scanner has proven to be very efficient over the past three and a half years," according to Salvadore J. Tillis, manager of medical systems and training for the Pan American Life Insurance Co. (Palic).

"In order to capture data from 5,00 claims a day, a total of 42 keypunch/verifier operators would be needed. This would result in a cost of about $30,000/mo or about 33 cents per claim," he said at a recent OCR Users Association conference.

"With our scanner we have reduced keypunch/verifiers to four or a cost of $3,200/mo. The cost of running the scanner (including operators and overhead) is about $10,000/mo," he said.

Palic is the Part B Medicare carrier for the state of Louisiana. Each year it receives about one million claims and pays benefits of about $33 million.

Palic's cost per claim is about $2.83, of which about 60 cents is spent for DP services (both the capture and processing of data).

In order to have a Medicare Claim processed, a beneficiary or physician/supplier has to submit a form with all of the details for processing the claim, such as beneficiary identification, physician/supplier identification, pertinent data on the services rendered and signature requirements.

Since this data is used to process the claim, to supply information to various application systems and also to fulfill the many requirements the Social Security Administration (SSA) it all has to be captured, Tillis emphasized.

In addition to the problem of capturing data, a carrier is faced with the major problem of fluctuating claims receipts. "At Palic, our receipts fluctuate from about 3,500 claim/day to over 5,000. These fluctuations are usually not predictable and occur at various times during the calendar year," Tillis said.

To complicate the matter even further, SSA and Palic insist on timely processing of claims. Therefore, data capture has to be accomplished rapidly, no matter what the volume of receipts.

Search for Best Method

These problems led Palic in 1972 to conduct a major investigation concerning the best methods of capturing data, Tillis said. Costs, space and "computer power" were major considerations.

Palic had been awarded the Part B contract for Louisiana in July of 1966. From 1966 until 1968, claims receipts grew to 1,200 claims/day. The input was prepared

(Continued on Page 32)

CPI 'Hybrid' Hardware Monitor Links to Software Module in CPU

By Patrick Ward
Of the CW Staff

WATERLOO, Ont. – The DSP-1 from Computer Performance Instrumentation, Inc. (CPI) is a "hybrid" hardware monitor that is said to provide most of the benefits of a software monitor without the resultant overhead.

The DSP-1 system combines a 22K software module that runs in the host CPU with a hardware monitor system including two processors and up to 384 sensors, the company said.

When a user measures an application program for the percentage of activity in subroutines, I/O routines and so on, the software module locates the program and sends the address boundaries of the program to the hardware monitor, CPI said.

The hardware monitor can then do a 24-bit comparison on every address it samples to see whether the address falls within the range of the application program. The data comes in over a communications link between the host CPU and the monitor.

From that point on, the data is being captured and stored within the DSP-1's memory without overhead on the mainframe, according to CPI.

After monitoring is completed, the user has the option of transmitting the captured data back to the host CPU for processing by the module. The host can then output the performance measurement data on its high-speed printer, the vendor said.

Data can also be archived on any data set or transmitted to a CRT, CPI added.

When the DSP-1 user wants to monitor a different application program, the monitor, under program control, can select probes from which it wants to receive data. The system can sample at the rate of 2.85 million sample/sec, if needed, a spokesman said.

The DSP-1 has a main processor, the DSP-1, and a subprocessor, the Continuous System Monitor (CSM) that handles system profiles. Each has independent memory, so the CSM can continue data collection for a system profile even as the DSP-1 does mapping, CPI said.

CPI said it installs 100% of the DSP-1 system, including benchmarking, on-site training and all software in source form.

The DSP-1 can currently operate with IBM 360/370 CPUs and with Honeywell 6000 CPUs, CPI said.

The system costs $25,000 from the firm at 572-7 Weber St., N. Waterloo, Ont., Canada N2L 5C6.

Parallel Control Unit Handles 165, 168 Frequency Converters

DEER PARK, N.J. – IBM 370/165 and 370/168 users can obtain from KW Control Systems, Inc. a parallel control unit for redundant (load-sharing) operation of the 75 kVA, 415 Hz frequency converter units.

The parallel control unit is compatible with either the company's standard model IBM-approved frequency converter or the Silentbloc model (for computer room installation). Both units are manufactured by Anton Piller K.G.

In a parallel configuration, multiple frequency converters feed a common load. The load is equally shared between the frequency converters on-line.

This system will allow an indiviudal converter to be placed manually off-line for preventive maintenance or will take it off-line automatically in the event of failure.

In either case, the remaining frequency converters will divide the load without loss of power to the CPU.

If additional CPUs are added to the computer system, frequency converters can be added in parallel to provide the extra power. In a typical configuration, there is one more frequency converter than there are CPUs.

The price for a system consisting of dual 75 kVA frequency converters and a parallel control unit ranges from $49,400.

Delivery is four months from the firm at 151-17 W. Industry Court, Deer Park, N.Y. 11729.

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Users and Vendors Blamed for OCR's Slow Progress

SCOTTSDALE, Ariz. – Optical character recognition (OCR) has failed to live up to its promise during the last several years and both vendors and users are to blame, according to Harold O. Casali, president-elect of the National Association for State Information Systems (Nasis).

"From my perspective, in the 1960s and early '70s the OCR supplier was searching for a buyer," Casali told attendees at the OCR Users Association winter conference here recently.

"There was no organized effort to help governments solve their many diverse problems with OCR hardware. Instead, we saw a one-to-one marketing approach for automated test-scoring or single order-entry systems using OCR techniques.

"During this same period the terminal entry CRT industry grew exponentially. Last year alone terminal and communications growth was up 50%. Compare this with data entry growth of 20% and CPU growth of 12%.

"The opportunity was there. Perhaps [OCR vendors'] marketing efforts lacked the proper perspective," Casali said.

Did the OCR vendors handle service and maintenance as well as they could have? "At least in remote areas, I know all too well the answer here is a definite no," Casali said.

Users expected and accepted a 1% to 3% error in keypunching, but why did they buy 100% "error-free OCR equipment"? Casali asked. "Did the vendors make sure the OCR users knew how to handle the rejections?

"Only today are we beginning to evaluate error- or rejection-handling techniques that should have been put in place when the first OCR equipment was delivered," he said.

A lack of industry standards for fonts, forms and codes has also hampered OCR, he said. "No dominant manufacturer established the 'right' way to do things, yet several manufacturers forced the users to lock themselves in with their forms or wand readers," he said.

User Failures

But users also failed to take advantage of OCR's opportunities, Casali said.

"Was this because user management did not really know the true cost of data entry?" Casali asked.

"According to the Nasis annual report, only one state had full central control of all data entry keypunch services. That state was my own – West Virginia.

"Given 175 keypunch operators, it was easy for me to become keenly aware of the management costs and problems associated with data capturing," he said.

What users failed to recognize, Casali said, was that until they centralize data entry, "or at least get their arms around the costs and problems," there can be no solutions.

DPers were also not prepared to handle their input forms with the care necessary for OCR, he said.

"We refused to avoid smudges and writing on the input media. Likewise, few users had draftsmen or good form designers on their staffs. By not accepting the challenge and addressing the problem, all too often we became disillusioned with the OCR panacea.

"Had we enforced clean operating environments and encouraged professional input forms design, we could have improved the acceptability of OCR input," he said.

Resistance Provoked

The idea of replacing key-entry workers with a scanner also provided resistance.

"In a political environment you don't eliminate jobs. That would mean fewer votes," he noted.

Management also responded in a manner of self-protection, he said. Its prior experiences indicated that the larger the operation and span of control, the better the opportunity for advancement.

"In other instances, although the input manager was superb in handling people, he lacked the perspective to evaluate hardware effectively," Casali said.

Future of OCR

The future of OCR lies in the integrated application that combines human satisfaction and productivity, Casali said, adding OCR hardware must be used in a mixed media and interactive hardware environment. System designers must consider the entire spectrum of the application, he added.

Integrating OCR entry with terminal inquiry into a structured data base producing a meaningful and usable output report is handling information well; DP should be a vehicle for information science, whose challenge is to use "all the proven technology in an orderly, thorough and humanistic manner," Casali concluded.

OCR Saves Insurance Firm $16,800/Mo

(Continued from Page 31)

by keypunchers.

In 1970, the claims receipts started fluctuating greatly from 1,500 claim/day to 3,500, Tillis said.

"Our keypunch section could not adjust to such drastic changes. Thus, we developed our first data input backlogs. To resolve this backlog, we added more keypunch staff and used outside data entry firms," he recalled.

In 1972, the receipts climbed from an average of 2,500 claim/day to an average of 3,300. Another data input backlog developed.

"It became evident that keypunches and verifiers were not the answer to our input problems. We had to develop a method of inputting our data on a timely basis no matter what the volume," he said.

Palic began an intensive investigation into the various methods of input in January of 1972. It investigated key-to-disk (with edits), on-line data entry using CRT, key-to-tape (without editing) and scanning (with edits).

"All of these had many merits and could have been developed. However, after careful consideration, scanning was chosen as the solution to our problems," Tillis said.

His reasons included:

- Palic did not have the computer capacity to implement a full on-line data entry system with 30 CRTs.
- Key-to-disk and key-to-tape were still subject to workload fluctuations.
- Palic had to maintain the hard copy of the coded input document. Therefore, the document had to be prepared. Scanning could capture the document with no manual intervention after it was prepared.
- Costs of the other devices at that time exceeded the cost of a scanner.
- The scanner provided additional available time for increases of claims with no increase in cost.

Based on these five major reasons and various other decisions, Palic chose a Scan Data 250 scanner.

"At the beginning of implementation, in June 1972, we were scanning about seven hours a day. Today, with a larger workload, we are scanning 12 hours a day. Thus, the scanner has met our needs over the past three and a half years," Tillis said.

Palic's claims are initially sent to the scanner typing section for control purposes. Later in the processing, some claims may be sent back to the same section for the typing of alphabetical corrections.

"Our typing pool consists of only five people. These people handle the typing of all corrections for 5,000 claim/day. The same five typists perform the control typing for these claims," Tillis said.

"Our total cost is $13,200/mo or a savings of $16,800/mo over the old keypunch system. Our present data capture costs are about 14.4 cents per claim," he said.

"In addition to the large savings, the scanner has been most efficient," Tillis said.

"We have about one substitution per 12 claims on hand-printed characters and one substitution per 2,000 claims on machine or typewritten characters. These substitutions are captured later by the use of computer edits.

The scanner reads an average of 700 to 750 claims per hour. It also has an excellent downtime ratio. "We only get about one rejected character per three claims. We estimate that we are using only about 10% of scanner time to correct the rejected characters," Tillis concluded.

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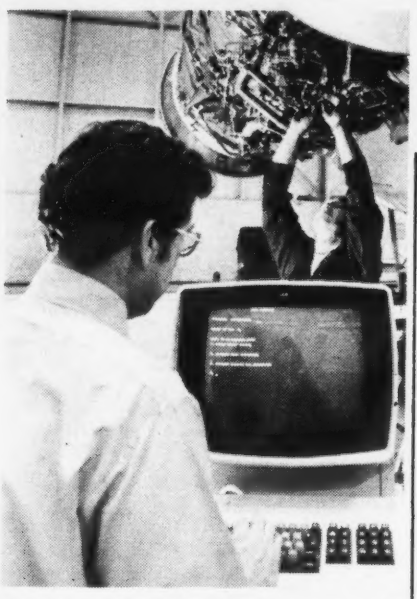
Information Once Two Weeks Late

Sceptre Gives Airline Upkeep Profile of Every Plane

MINNEAPOLIS – Before a passenger sets foot on a North Central Airlines (NCA) plane for a flight, NCA officials can look at a CRT screen to check how many hours the engines have flown and how many touchdowns the landing gear has absorbed.

The carrier's maintenance staff can call up a profile of each of NCA's 51 DC-9s and Convair 580s to learn when an engine was last overhauled or a new tire put on. That sort of information was previously three to 15 days late.

The information is now up-to-date be-



North Central Airlines' maintenance staff can obtain a maintenance profile of every plane in its fleet through CRT terminals located in maintenance hangers, overhaul shops, parts storage areas and company offices.

cause of NCA's System Computerized for Economical Performance, Tracking, Recording and Evaluation (Sceptre), which runs on the airline's IBM 370/158 and 370/65 here.

"Sceptre provides instant status reports on every plane in our fleet" to 150 CRT terminals, according to Robert L. Gren, NCA's vice-president of maintenance and engineering.

"A mechanic in Detroit and an engineer in Minneapolis can instantly get information on a particular plane. Sceptre provides companywide records to help us operate an economical and reliable maintenance program," he said.

"Generally, the reaction from mechanics is that they feel they know a lot more about the airplane than they did before," he added.

Using a CRT, a mechanic or pilot can check the maintenance functions being done on each airplane, including an up-to-the-minute summary of which projects have been completed. Information displayed on the screen shows when a part was changed, why it was done, who authorized the work and who performed it.

IBM 3270 terminals are located in maintenance hangers, overhaul shops, parts storage areas and company offices. As work is completed, employees record their efforts and the system updates its file on a given aircraft.

While the 3270s are primarily located in maintenace bases in Minneapolis, Chicago and Detroit, employees can use the system whether located in New York or Winnipeg. This is because of the specially designed Escort reservations terminals installed in more than 100 offices and airline facilities.

Information contained in Sceptre's files is supplemented by Escort. "Since our maintenance and reservations files are linked, we know the takeoff and arrival times of each plane," according to John R. Pennington, project administrator for Sceptre.

Controls Maintenance Costs

NCA officials believe Sceptre will prove especially valuable in controlling maintenance costs, which represent approximately 16% of an airline's total operating costs.

Users enter information into Sceptre's files across the airline's system virtually round-the-clock seven days a week. This information includes maintenance schedules; the status of hundreds of types of parts; data on some 18,000 required inspections and 42,000 parts; work done and work slated to be done; and management information.

NCA uses IBM's Information Management System (IMS) to help manage the information in the files.

The system helps balance inventory to assure the right amount of parts and equipment are carried, Pennington said. This, in turn, helps reduce costs and pinpoint seldom-needed stock items.

The system alerts management to problem situations (such as a part repeatedly malfunctioning in a single plane). Using a special brightness capability on the CRT, a user can highlight these problems for special attention.

CVD Digitizer Runs Under Micro Control

BEDFORD, Mass. – The CVD from Computervision Corp. is a microprocessor-controlled, high-resolution digitizer for use with the company's Designer line of computer-aided design systems.

The CVD's features include absolute digitizing; 36-in. by 48-in. active digitizing area; variable-intensity backlighting over full active area; free-floating pen or puck digitizing head; the capability of digitizing in point mode or stream mode; and foot switch control of stream digitizing and line break.

The CVD also features 32-character alphanumeric message display assignable to display X, Y and Z coordinates up to seven decimal places and a user-defined menu anywhere in the digitizing area, Computervision said.

The digitizer costs from $15,000 to $25,000, from the firm at 201 Burlington Road, Bedford, Mass. 01730.

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Mini Bits

Digimetrix Disk Controller Works in Hostile Sites

HAYWARD, Calif. – Digimetrix, Inc.'s Series 300 is a 3M- to 23M-byte plug-compatible disk memory controller system for "most popular minicomputers," the firm said.

The system can operate in hostile environments with 10G shocks, temperatures of 0°C to 55°C and dust, Digimetrix said.

The equipment is designed around a sealed, self-contained disk that can be tilted at angles of up to 45° without affecting performance, according to the company.

The Series 300 comes with an operating software package that includes an I/O printer, disk diagnostic program and disk operating system. It costs $3,950 from the firm at 20954 Corsair Blvd., Hayward, Calif. 94545.

'Imposter' Turns Tape Cassettes Into I/O Media for Minicomputers

HAUPPAUGE, N.Y. – A universal read/write device called the "Great Imposter" from RAL, Inc. allows Redactron Corp.'s magnetic tape word-processing cassette to be used as I/O media for minis, a Redactron apokesman said.

The reader "looks like" a paper tape device to the typesetter or minicomputer, according to the spokesman.

The write-only model costs $3,000; the read-only model is priced at $3,500; and the read/write model sells for $4,500. Redactron is at 100 Parkway Drive South, Hauppauge, N.Y. 11787.

Harris Brings Out Printers

FORT LAUDERDALE, Fla. – Harris Corp. has introduced the Series 4100 line printers for use with its minicomputer systems.

The printers use fully buffered, 136-column impact-type drum printing mechanisms that print a 64- or 96-character set.

They are availale in four models which range from 64 characters at 300- to 600 line/min to 96 characters at 240- to 436 line/min.

The 300 line/min printers cost about $14,000 and the 600 line/min models cost about $19,500 from the firm at 1200 Gateway Drive, Fort Lauderdale, Fla. 33309.

Worth the Headaches

Budget Watcher's Answer: Used Machine

By Esther Surden
Of the CW Staff

HOLLYWOOD, Calif. – Why did Trans American Video, Inc. buy a used minicomputer?

Money was the reason, according to Jim Conlon, who is responsible for software development for the firm. The company estimated it spent about $15,000 on a system that would have cost about $30,000 new and stayed within its operating budget.

Trans American is a television service organization which provides videotape-editing facilities as well as studios, crews, trucks and almost anything else a producer needs, Conlon said. The Merv Griffin and Sammy Davis shows are taped at its studios.

For videotape editing, the firm has three Orrox Corp. CMS minicomputer-based editing systems. Previously, all videotape editing was done manually, Conlon explained, but now a producer sits in a comfortable room with a CRT and makes changes, runs the tape through to see if the changes will work, makes additional modifications or wipes out the corrections and starts again.

When the producer is sure of the version, the tape is edited via the minicomputer.

All hardware and software for the three systems is provided by CMX, Conlon added.

"We decided to take the system's editing capabilities farther by creating our own software," he continued, "so about three months ago we decided to get our own computer for software development."

Trans American bought the used computer system from California Data Lease, an Anaheim-based used computer dealer.

At first the firm decided it wanted a PDP-11/03 system from Digital Equipment Corp. because the CMX systems are based on PDP-11s and the company was "tied into" that firm's products for software development purposes.

The system would have included a CPU, dual floppy disk, Decwriter and RT-11 software. But, Conlon said, that system was not powerful enough for the company's needs.

"We began to go to the used computer firms, American Used Computer Corp. and Newman Computer Exchange, that we'd seen advertised." Data Lease was the only one that could provide what Trans American needed at the time. Conlon added, so the company asked the dealer to put together a package for it.

The package consisted of a PDP-11/15 with 8K of memory, a System Industries, Inc. disk controller, two Diablo Systems, Inc. disk drives and a Centronics Data Computer Corp. serial line printer.

An MBD Systems interface card, Teletype Model 33 and 16K of additional memory from Plessy Memories, Inc. were not part of the package, but were added. In total, the system cost about $15,000, Conlon said.

Trials and Tribulations

It took three months to get the system working, Conlon admitted. As the order arrived in boxes, the firm began assembling the components on its own.

"Luckily we had the technical knowledge to do this," he said.

Trouble came when a "pigtale" cable

(Continued on Page 36)

Words of Caution

Are you thinking of buying a used minicomputer?

George Seldin of California Data Lease offered some hints:

- Know the difference between new and unused. New equipment is purchased from the manufacturer or its representative with guarantees. Unused can be purchased from a used computer dealer and may have been sitting in a warehouse for several years.

No upgrades will have been made to the unused equipment and it usually carries no guarantees, Seldin noted.

- When buying a used mini, find out what kind of guarantees came with the equipment or if the mini is being offered "as is."
- If possible, hire a qualified engineer to inspect the equipment to make sure it's in good working condition.
- When the deal is set, go to the bank with the money to purchase the system. Buy a letter of credit or a bank draft that spells out exactly what you are buying. Then you are sure of being protected, Seldin said.
- When you get the equipment, place it under maintenance. If it doesn't work, notify the seller that you are returning it at his expense. This should be agreed upon by both parties, beforehand.
- Purchase and sales agreements should enumerate the obligations of both the buyer and the seller.
- Know what you want and buy equipment that the manufacturer or an independent agency will maintain and service.

CSC Adds Turnkey Lab Reporter For Quality Control Applications

LOS ANGELES – The Laboratory Data Acquisition and Reporting System (Ladar) from Computer Sciences Corp. (CSC) is a minicomputer-based product quality control system.

The system supports the laboratory technician by on-line automation of numerous instrument tests, the firm said. It can track a sample from the assignment of its number at the time of log in through the tests scheduled for that sample to the subsequent storage of test results in an historical data base, CSC said.

Available with either a Hewlett-Packard (HP) 21MX or Digital Equipment Corp. PDP-11/40 system, Ladar provides automated instrument testing, nonautomated instrument testing, data management and reporting, statistics, results data plotting, spectral data acquisition, communications and background data processing, CSC said.

A typical system costs between $125,000 and $130,000, including the hardware and software. For the PDP-11-based system, hardware includes 64K words of core and two 1.2M-word disks; the HP configuration contains 32K of core and one 1.2M-word disk.

CRTs, line printers and instrument interfaces suited to a user's needs are available, a spokesman said from the firm at 9841 Airport Blvd., Los Angeles, Calif. 90045.

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Replaces Programmable Calculator

Firm Uses Mini to Prepare Input Data for Mainframe

By Esther Surden
Of the CW Staff

ST. JOSEPH, Mo. – An operating division of a wire rope company is using a portable minicomputer to prepare input data for the firm's large mainframe.

The user, the Fabricated Products Division of Wire Rope Corp. of America, previously used a Wang programmable calculator. The Wang unit proved unsatisfactory because it couldn't produce printouts and perform other operations the firm needed, Ray Wheeler, engineer for the division, said.

The firm chose the IBM 5100 because it was the "ideal machine" for the job, Wheeler said.

"It is adapable to report printing, production scheduling and order efficiency accounting," capabilities that were unavailable from the programmable calculator, he added.

The firm's mainframe is an IBM 370/155. "A lot of time was spent devising input for the 370," Wheeler continued.

The 5100 designs swage fittings for the company. Everything the user fabricates must be custom-designed, Wheeler said, because no two users of wire rope slings and cable assemblies want precisely the same configuration.

"In this division, we take steel cable and make it into an assembly a customer can use." This can range from putting a loop on each end of some wire rope or a hook on one end to making a break cable for automobiles, Wheeler added.

The firm enters the rope diameter, finished diameter and length of the fitting into the 5100 and waits for the mini to calculate the customer requirements and print out the finished design. This takes a few seconds for an operation that previously took hours, he said.

The system catalogs and indexes drawings for the firm. In the future the company hopes the machine will scan its files of designs when a job is entered and, if a part of the job has already been designed, copy the design instead of preparing a new one.

This capability will be added via a graphics package. Wheeler said.

The firm originally bought the 16K 5100 with Basic and a high-speed printer for about $13,000 in December and has since upgraded the memory to 32K for an additional $3,000, Wheeler continued.

The system performs production scheduling. Plant operations involve three shifts of workers using 10 basic fittings in a number of varieties. The mini helps keep control over manufacturing and scheduling.

With rapid price changes and the customized nature of the business, the system will also be used to keep an up-to-date price list. Costs will be monitored on an order-by-order basis with general cost data frequently updated.

College Mini Performs Large-Scale Computations

BERKELEY, Calif. – Careful cost analysis showed scientists at the University of California here that minicomputers are "a realistic alternative to machines such as the Control Data Corp. 7600 or IBM 360/195" for use in theoretical computational calculations.

A paper prepared by Dr. Henry F. Schaefer III of the department of chemistry and presented at the IEEE Computer Society Conference in Washingfon, D.C. in September 1975 outlined the process that led Berkeley to choose a minicomputer.

The department of chemistry had been using a CDC 7600 located at the Lawrence Berkeley Laboratory. The laboratory charged $720 for one hour of CPU time, but input/output charges made separately often brought the price up to about $1,500/hour, the paper said.

Assuming a yearly budget of about $24,000 for a chemist with seven graduate students, the entire department would be able to afford only 16 hours a year on the computer, Schaefer said.

The university began the selection process in 1973. Salesmen of six different companies were contacted, and the specifications for the Data General Corp. Nova 800; Digital Equipment Corp. PDP 11/45; Texas Instruments, Inc. 980; Varian Data Services V73; Xerox Corp. 530; and the Datacraft Corp. 6024/4 were studied.

The six machines were singled out, the paper said, because they could be configured to do the computational work for about $125,000, and each had "sufficient speed" to make theoretical chemistry a "real possibility."

The department chose the 6024 because it could directly address 32K floating-point words of 48 bits with a 39-bit mantissa, providing 11 significant figures, a number that was "ideal for our purposes," the paper said. The mini was also faster than the other systems, with worst case floating-point multiplication at 5.25 μsec.

Monthly Cost Lower

When purchased, the system cost $129,633 or $2,701/mo over four years. The service contract cost about $1,155/mo. Electricity, cards and paper were estimated to cost about $300/mo.

When all factors were added, the total monthly cost became $4,156. Assuming the mini was 64 times slower than the CDC machine and figuring this into the cost computations, the university found they "would be able to purchase the equivalent of 7600 time for $443/hour."

The manufacturers now have faster minicomputers than they had previously, and, if the study were repeated the results might be different, Schaefer said.

The configuration at the chemistry department includes a CPU with 64K memory, floating-point hardware, clock, teletypewriter and controller, card reader, line printer, magnetic tape drive and controller, 28M-byte disk unit and controller with Fortran IV compiler and a disk operating system, the paper said.

Minor Problems

The initial half year of operation was frustrating for the department. Quite a few minor problems plagued the system.

Some were later found to be caused by an integrated circuit on the memory timing and control board. However, this problem was not traced and corrected for many months, according to Schaefer.

Also frustrating were delivery dates on the scientific arithmetic unit, necessary for this department's experiments. The hardware arrived two months after the promised delivery date, Schaefer said.

By the end of the third quarter after installation, the mini was "meeting or exceeding the goals that had been set for it" and is continuing to do so, Schaefer added.

For Molecular Analysis

The main purpose of computational chemistry is to understand the electronic structure and dynamics of molecules. "We attempt to understand what electrons are doing in molecules," Schaefer said.

Basic data is fed into the mini and coverted into intermediate functions called "2-Electron Integrals" (2-EI) which, when calculated, express the repulsions between pairs of electrons.

There are normally 2 million to 3 million 2-EIs in a typical problem, and the algebraic formula required to calculate just one of these, if written out, would cover four or five pages.

The mini does the calculations at about 100/sec, Schaefer said.

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Firm's Profits, Costs and Efficiency Tracked by Mini

INDEPENDENCE, Mo. – Individual employee efficiency, crew efficiency, job cost and the profit on the operation of each job are tracked by a minicomputer at a metal fabrication job shop here.

"We bring the cost-per-piece problem right down to the man on the machine. Each day he knows his production rate," President Edd DeTray of A-Z Manufacturing and Sales Co., said.

"The operator checks our daily employee efficiency report with his foreman, who tells him if he is not making a satisfactory rating. If he does produce well, he gets a bonus."

The firm employs about 55 workers in its plant which houses tape-controlled fabricating presses, 12 punch-presses, seven brakes and a tool and die shop.

Production runs are usually in the range of 50 to 10,000 items, although occasionally more.

At any one time there are from 150 to 300 jobs in process, each requiring about six opeations, according to the company.

"With a varied product mix like ours, it is more difficult to measure plant efficiency," DeTray said.

DeTray chose the NCR 399 system because the firm felt the mini could be programmed in-house and cost less than anything else it considered, including IBM and Burroughs Corp. systems.

The system cost about $33,900 when purchased in Jan. 1975, plus an additional $10,000 in software programs. Five people are employed full-time to run the mini, which includes the CPU with 16K bytes of memory, three tape cassettes and a 100 line/min printer, DeTray said.

Before the system was installed, A-Z used a service for about four years for weekly job costs and payroll. But the data was available too late to be of real value and, despite the limited number of applications, costs approached those of the present system, DeTray added.

A detailed job-cost analysis usually produced weekly and lists completed jobs, telling the firm on which jobs and operations a profit was made.

An employee efficiency report, set up by each foreman and listing efficiency of each of his crew members is available by 8 a.m. each morning, DeTray said.

The weekly employee efficiency report becomes part of a worker's file and lists information from the daily report as well as worker's incentive bonus points. A daily foreman's report includes the estimated cost and income each crew produced for the previous day. Foremen receive bonuses based on their crew's performance, the firm said.

A progress report summarizes in what stage of production each job in the shop is and represents a valuable scheduling aid, according to the firm.

Reports that pinpoint the areas of the shop that need price increases or additional operator training are also available. Another listing tells what jobs are waiting to be run on which machines and the time allotted for each job.

When A-Z bids a job, the bid includes all basic facts on the job so that, if the bid is accepted, the information is at hand to be fed into the computer. And, working from the bid sheets, the data on jobs is keyed into the computer in the order it is anticipated they will be run in the plant. This information is stored on a tape cassette.

As the job is worked, the time-card data which includes job number, operator number, pieces produced, whether the worker made the set-up, the time he finished the job and the time he started work is fed into the system. Standard hours were stored previously.

The price bid also was fed in as part of the bid sheet data, so when the item is shipped it is manually priced; the system produces the priced invoices; the two are compared; and invoices are sent out.

Used Machine Worth The Tribulations For Budget Watcher

(Continued from Page 34)

that the user needed was not included and had to be ordered. When the line printer and disk drives arrived, problems developed again. The cables between the disk controller and the drives were incompatible with the software of the controller manufacturer, Conlon explained.

Two cables had to be ordered and took about 40 days to arrive. The $700 cost came out of Data Lease's pocket, Conlon noted.

Ordering software for the system was also difficult. DEC wouldn't lease the RT-11 operating system directly because the disk drives were not DEC's so, Conlon said, he went to System Industries.

System Industries got the software from DEC, then patched in its own modifications. The patches cost $300, Conlon said.

After the system was up and running, hardware errors began to develop and service was needed. "We found we couldn't do reads" on the disks, Conlon said.

To correct the problem, a head alignment was performed. The result was an extra $500 in service calls, he recalled.

Worth the Effort

The system has been running for several weeks now and, when asked if it was all worth the effort, Conlon said that it was – but not for everyone. His firm was willing to take the risks involved.

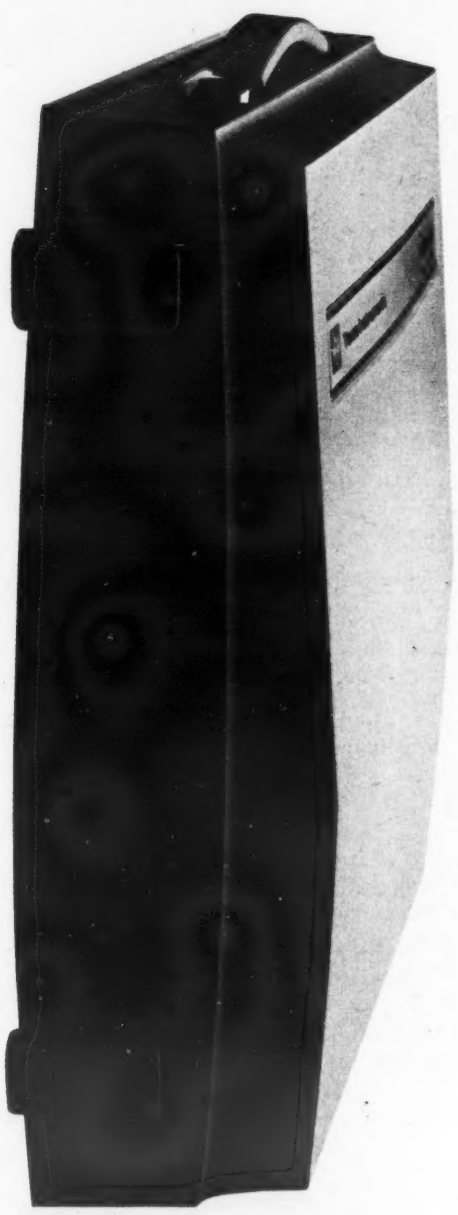
The company hopes to use the mini for innovative software development to further automate the videotape-editing process, Conlon added. Programs in this field require the operator to communicate to the mini via the keyboard. Alternatively, programs can control the handling of videotape recorders or switchers (machines that make cuts, fades and dissolves).

Routines also handle the editing decision file that lists the time an edit takes place and its effect (dissolve, cut, etc.). A program can have about 150 different editing decisions, Conlon explained.

The firm will use the mini to make more advanced editing decisions and to allow the operator to use the system in a more efficient way, Conlon said.

"There is no reason why, when the mini is using video recorder one and two and they are implementing the mini's instructions that number three can't be getting ready to work," he added.

LIGHTWEIGHT



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Either way, these two new terminals from TI are the lightest and quietest available, and extend the "Silent 700" tradition of price/performance leadership.

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To Help Tap Energy Source

Real-Time Mini Monitors Underground Coal Gas Fires

HANNA, Wyo. – Prompted by this country's energy crisis, scientists are using minicomputers to monitor the underground coal gas supply here and help find ways to tap it.

The Hewlett-Packard (HP) 9600 series Data Acquisition and Measurement System containing an HP 21MX processor as well as a signal-conditioning subsystem is being used to monitor some 200 sensors, including thermocouples placed in input, output and special instrument wells.

In addition, pressure, flow, wind and geological characteristics as well as gas chromatography analyses of output product gas are recorded and processed by the system in real time.

The results can then be used by Energy Research and Development Administration (Erda) researchers of the Laramie Energy Research Center (Lerc) to alter ongoing experimental conditions.

"The real-time minicomputer is one extremely important aspect of having successful experiments," according to James Eastlack, a Lerc engineer.

"These experiments are only as good as the data we obtain. In the past, it has been extremely difficult to characterize exactly how reactions are proceeding. The minicomputer provides us with immediate feedback – we no longer have to operate by the seat of our pants," Eastlack said.

For example, at the start of the experiment, there is an initial burn period after the ignition is begun which, if left to burn too long, may ruin the well by causing combustion products, such as tar, to build up and clog passageways in the coal seam. The mini aids in preventing this by monitoring conditions.

The system is also helping determine where the burn is located at any given time, how it is progressing and how much air is required to suit the combustion below. Operators then reset valves accordingly.

Previously, a great deal of manual work had to be done. Meters were read, forms were filled out and the data transferred to cards by keypunch operators.

Erda's undergound coal gasification experiments here entail deep-well drilling and ignition of the coal seam. Air for combustion is supplied by high pressure pumping through a second well, located nearby.

The coal seam is permeable because of natural fractures and cracks, and air from the second, or injection, well therefore reaches the combustion area.

The combustion zone then "seeks" this air supply and advances towards its source. This is called a reverse combustion because the flame front moves in a direction opposite to the air flow direction.

Eventually, the two wells become "linked" by means of carbonized paths through the seam that greatly increase permeability. Once this permeability is attained, air pressure is reduced while air volume required increases drastically.

At this point, gasification begins and the product fuel gas is tapped at what was the ignition, now called the production, well. Steam and oxygen injection are planned to improve the quality of the product gas.

Multichannel Loggers

In conjunction with Lerc, Sandia Laboratories has instrumented 15 wells which are also feeding data to the system.

Some temperatures are recorded by multichannel data loggers and others by a HP 2313 analog-to-digital signal conversion subsystem; the data logger is completely controlled by the mini.

Cold junction compensation for HP 2313 readings is performed by software. Temperatures are automatically sampled throughout the experiment at five-minute intervals.

In addition to the temperatures, some of the other data collected include injection and production pressures, wind direction and velocity, rate of air flow input, rate of gas production, product gas temperatures and chromatograph analyses of the product gas.

Software was developed by Erda for measuring both injection and production flows at five-minute intervals, from which hourly average flow parameters are obtained.

The minicomputer system now being used in the Hanna experiments includes a 32K HP 2100 processor Real-Time Executive (RTE-II) software operating system, an analog-to-digital interface with seven programmable cards, a cartridge disk storage unit, paper tape reader and punch, 9-track tape transport and matrix printer plus a data logger.

A terminal operating at 1,200 bit/sec is located at Lerc, 80 miles aways, for remote monitoring of the system.

1K MOS RAM Circuits Available From Intel

SANTA CLARA, Calif. – MOS equivalents of 1K-bit bipolar random-access memory (RAM) circuits are available in OEM quantities from Intel Corp.

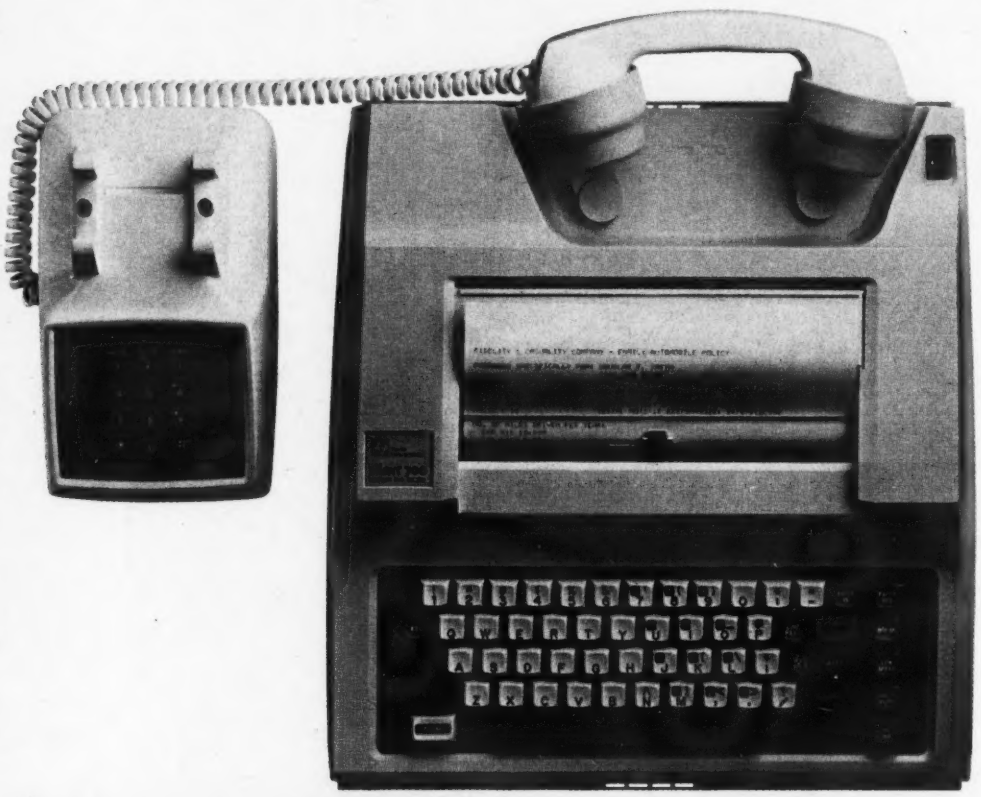
The 2115 and 2125 family of 1K static MOS RAMs can operate as fast as their bipolar counterparts at the same power supply voltage and logic levels, a spokesman said.

The 2115-2 and 2125-2, with a maximum access time of 70 nsec, are equivalent to the 93415 and 93425 bipolar models originated by Fairchild Semiconductor, Intel said.

Also available are the 2115 and 2125, with a maximum access time of 95 nsec, and the 2115L and 2125L, with a 95 nsec access time and 65 MA current.

The RAMs are available in either ceramic or plastic versions. Models 2115 and 2125 cost $14.20 in ceramic or $12.70 in plastic in quantities over 100. The 2115-2/2125-2 cost $15.60 and $14.10, depending on the makeup of the chip, and the 2115L and 2125L cost $19.80 and $18.30 in either ceramic or plastic respectively from the firm at 3065 Bowers Ave., Santa Clara, Calif. 95050.

HEAVYWEIGHT



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TEXAS INSTRUMENTS
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Logical Has 8-Bit Micro

MOUNTAIN VIEW, Calif. – An 8-bit microcomputer system called the Servant 8 and designed around an Intel 8080A microprocessor is available from Logical Services, Inc.

Designed for OEM industrial control and production test systems and data acquisition and memory testing applications, Servant 8 contains a CPU, control, memory and I/O modules that plug into an integrated backplane board, Logical said.

Software for the system includes a monitor program that can be accessed when power is turned on, eliminating bootstrap or manual startup procedures, the firm said.

The system can include an oscilloscope display and a light pen.

A four-module Servant 8 in a chassis with power supply, backplane, control panel, teletypewriter interface, CPU module, 4K static random access memory and 1K erasable read-only memory containing the monitor program costs about $1,800 in single-unit quantities, Logical said from 711 Stierlin Road, Mountain View, Calif. 94043.

Four-Bit Micro

GAITHERSBURG, Md. – A 4-bit microcomputer is available from International Microsystems, Inc. (IMI).

The Model 4041 contains an Intel 4040 CPU with 60 instructions, interrupt capability, 24 index registers, seven levels of subroutine nesting and 1K each of random-access memory and programmable read-only memory, IMI said.

The system costs $295 from 122 Hutton St., Gaithersburg, Md. 20760.

Hitachi Designs ECL RAMs

TOKYO – Hitachi, Ltd. has developed two 1K-bit bipolar random access memories (RAM) using emitter-coupled logic (ECL), the firm said.

The HM2110 and HM2110-1 RAMs are 56% smaller than chips using conventional technology, Hitachi said. The HM2110 has a maximum access time of 35 nsec and the HM 2210-1 has a maximum access time of 25 nsec, according to the firm.

The RAMs will be available to U.S. users next month, Hitachi said. The prices are expected to be 10% to 20% less than those of conventional units, a spokesman said from Bell and Stanton, Inc., 909 3rd Ave., New York, N.Y. 10022.

Sunshine Kpram For Development

PASADENA, Calif. – Sunshine Electronics has a keyboard-programmable random-access memory (Kpram) for microprocessor and minicomputer development.

Random-access memory (RAM) and a 16-key board are coupled in the system, the vendor said. The Kpram and programmable read-only memory (Prom) are directly circuit-interchangeable through the normal

The P-24 with 256 (4-bit) words costs $215; the P-28 with 256 (8-bit) words and the P-54 with 512 (4-bit) words cost $265; and the P-58 with 512 (8-bit) words costs $325 from the firm at 228 N. El Molino, Pasadena, Calif. 91101.

Micro Products

Floppy Disk Kit Has Interface

ROCHESTER, N.Y. – Sykes Datatronics, Inc. has an OEM floppy disk system kit which interfaces to microcomputers.

The Floppy System Kit consists of a smart disk controller, one to four Sykes floppy disk drives, interconnecting cables and a hardware interface for connecting the system to microcomputers.

The disk controller is packaged on a PC board and requires less than 1 in. of space, Sykes said. Additional disk drives are daisy-chained from the first drive.

Price for one single-drive kit is $1,398 from the firm at 375 Orchard St., Rochester, N.Y. 14606.

I/O Controller From TI Replaces 8080 Circuits

DALLAS – Texas Instruments, Inc. (TI) has an I/O controller that replaces five or more support circuits for the firm's TMS 8080 and the Intel 8080A, the firm said.

The TMS 5501 operates under 8080 or 8080A software control and provides for the transmission of serial data, input and output of 8-bit parallel data, interrupt servicing and interval timing, the company said.

Asynchronous data is handled at rates from 110- to 9,600 bit/sec.

The 5501 prioritizes eight interrupts; interrupts are individually maskable by software and can be accepted as they occur or can be polled, according to the vendor.

The TMS 5501, packaged in 40-pin ceramic, costs $32.80 each for up to 24 units; a plastic version will be available later this year from the firm at P.O. Box 5012, Dallas, Texas 75222.

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COMPUTER INDUSTRY

CI Notes

GMI Approves Sales Talks

GRAHAM, Texas – Graham Magnetics, Inc. (GMI) has approved in principle negotiations for the sale of its business and assets to Sun Ventures, Inc., a subsidiary of Sun Oil Co., for a purchase price of $14.3 million.

The transaction is subject to the approval of the boards of directors of both companies and the stockholders of GMI.

GMI said it would seek to have Sun Ventures assume certain liabilities, but these do not include the assumption of any liabilities of GMI or certain of its officers or directors that may result from the "class action" suit of Lumpkin vs. Graham Magnetics et al, filed Dec. 31.

The final negotiations will take place only after the outcome of the suit is known, according to a GMI spokesman.

Fujitsu Expanding for Amdahl

TOKYO – Fujitsu has announced plans to expand production capacities of Amdahl Corp.'s 470/V6 to meet increasing incoming orders from U.S. users.

A total of eight systems have been exported to Amdahl since December 1974, while outstanding orders for the 470/V6 total 21 systems at the present time, according to *EDP/Japan Report.*

Based on the prospect of sizable additional orders, the present production capacity of two units a month will be increased to three units per month by this summer and four units by fall.

Fujitsu Increasing Spanish Interest

TOKYO – Fujitsu Ltd., has been authorized by the Spanish government to increase its interest in Fujitsu Espania S.A. of Spain to 100% from the current 50%.

Officials said the 50% interest in the Spanish company will be purchased from Banco Espanol de Credito.

Supershorts

Lear Siegler, Inc. has delivered its 10,000th CRT terminal to Mainland Computer Corp. in Stratford, Conn., a distributor of peripheral equipment.

– – –

AMS Semiconductor Division of Advanced Memory Systems, Inc. has established a European headquarters to expand sales of semiconductor memories and subsystems to OEMs in Common Market countries.

– – –

Pro-Log Corp., a manufacturer of microprocessor subsystems, has added sales representatives in Australia, New Zealand, Sweden, Switzerland and Italy.

Possibilities Seen Endless

Nets to Grow, Change in Era of Micros

By Molly Upton
Of the CW Staff

SAN FRANCISCO – The advent of microsystems will bring forth an era in which the growth and variety of network possibilities are almost uncountable, according to Earl C. Joseph, staff scientist and futurist at Univac.

The microsystem, in which applications and systems support software will be on the same chip as the processor and the memory, will present "a whole new ballgame" to those involved with networks, he said.

Joseph spoke at an IEEE Computer Society Compcon 76 spring conference session on "What Will Happen With Computer Networks."

By imbedding more software on chips, users' software costs can be reduced, he said. Through this development, users will be able to describe what is to be performed rather than how, he said.

"The groundrules are going to change and we might as well put as much functional or memory logic as possible into each chip," he said.

Micros will continue the trend toward decentralization of computing intelligence and will enable fault-tolerant computing to become a reality since backup of system elements will be inexpensive, he said.

Also, users will be able to grow within a system by adding microprocessors for specific applications rather than upgrading to a different system, he said.

The cost of such chips will be determined more by the universality, or high demand, rather than the complexity of the chip.

With that in mind, Joseph described what he would like to see in a smart interlace module.

It would have intelligence to handle the following variable features: bit, character and word handling; variable arithmetic operations and transformation; addressing, protocol methods and transformation; security/protection mode as well as electrical interfaces.

In addition, the smart interface would contain dynamically variable personalizing characteristics such as profiles of user, system and file as well as the ability to perform variable error control.

It would also contain system, network and distributed system smarts as well as handle variable interface conversion and transferability.

In addition, the system should be able to perform a host of variable data management functions as well as source data.

These modules will enable users to dynamically compile the internal architecture as well as their networks. They will be able to alter architecture in real time, he said. "Imagine the efficiency."

This type of unit will contain memory functions for storing parameter lists to define what part of its capability is used. Thus its internal architecture can be defined.

"The information to be loaded becomes the 'programming' task of such a future system. Note that this type of programming is not of the procedure-oriented language type wherein the program 'defines' how the system is to do the task, but rather a type of language for defining what the system is to perform," he said.

With the development of other special-purpose, hard program modules for appli-

(Continued on Page 40)

Japan DP Mart Developing With Government's Help

SAN FRANCISCO – With considerable capital infusion from the Japanese government, domestic computer firms are proceeding in development of both small- and large-scale computers as well as cooperative ventures, according to a paper prepared by Hitoshi Watanabe, Kazunori Shimayaa and Toru Mikami of Nippon Electric Co., Ltd. (NEC).

The six native firms have about a 50% share of the total computer market in Japan, Watanabe told a session at the IEEE Computer Society Compcon 76 spring conference.

The small computer field is growing very rapidly, at a projected annual rate of 30% to 35%, he said.

Five manufacturers offer systems costing less than IBM's System 32. Over half of all computers in Japan, 51.8%, belong in the very-small-scale group, and 24.4% are in the small-scale category, Watanabe said.

Total number of systems installed is 30,095.

Three Groups

Currently the six firms are aligned into three groups and will soon consolidate into two groups, he said.

The existing groups are NEC and Toshiba, Fujitsu and Hitachi and Mitsubishi Electric Corp. and Oki Electric Industry Co.

As evidence of activity in product introductions, three new series were announced in 1974 by NEC, Fujitsu and Mitsubishi-Oki.

This year will see the beginning of a national project to develop high-density large-scale integration (LSI) circuits with which to counter the expected IBM Future Systems.

Between 1976 and 1979, $300 million is expected to be invested in the effort. The LSI project will be conducted by the Ministry of International Trade and Industry (Miti), Nippon Telegraph and Telephone Public Corp. (NTT), NBC, Toshiba, Fujitsu, Hitachi and Mitsubishi.

The comprehensive automobile control system, funded for $17 million, is intended to develop a method of controlling auto traffic.

ERA to Attend Compdesign/76

CHICAGO – The Electronics Representatives Association (ERA) will be participating in each of the cities in which Compdesign/76, a show sponsored by *Computer Design* magazine, is appearing starting last week in Woburn, Mass., a Boston suburb.

Mingling with members of what they consider a very important segment of the marketplace, ERA representatives will join Compdesign/76 in New York, Chicago, Los Angeles and San Francisco.

"Contacting end users and OEMs alike at a show like Compdesign/76 is a function and a service the representative can perform for his principals and manufacturers, getting them some exposure and penetrating deeper into the market," Paul Mazzacana, communications director for ERA National, said.

ERA, which performs a marketing function within the industry between the representatives and the manufacturers, feels its participation is important because it sees, "as most economists and other people in the electronics industry, a tremendous growth potential in the whole area of computer and data processing," Mazzacana said.

Representatives from ERA's Technical Products Division will be staffing a table in each of the five Compdesign/76 cities. They will be available to discuss the use of representatives with marketing people who attend the show.

Many ERA chapters produce buyers' guides, and these will also be available in some cities to help the OEM or end user find sources of particular products they might want.

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Supercomputers Have Future, But Micros Seen Factor

By Molly Upton
Of the CW Staff

SAN FRANCISCO – Does the supercomputer have a future? Panelists at a recent IEEE Computer Society Compcon 76 session here generally agreed they do, but for different reasons.

John Blakemore of Texas Instruments said there will be supercomputers as the pendulum swings once again, but they may be super in a hierarchical sense – they will administer the multitude of micros that will be found in systems as well as daily life styles.

Consultant Charles T. Casale observed that with the current pricing structure by mainframes, notably IBM, it is likely supercomputers and minis could squeeze out the mainframes.

Francis J. Balint, executive director of the Office of Management and Computer Systems at the National Oceanic and Atmospheric Administration, presented the view of the user who has a need for even larger number-crunchers than those currently available.

Grosch's Law Updated

Blakemore pronounced a corollary to Grosch's Law, which states that prices of computer systems increase as the square root of performance increases. If the cost of micros is lowered through volume production, he said, the economies of scale may be greater than Grosch's Law provides.

Just as the '60s were the era of "bigger is better," the '70s are the era of smaller is better; "The micro bandwagon is rolling and won't stop in the '70s," he said.

Bandwagons start rolling, he remarked, not necessarily because of technical merits, but because people wish to take advantage of and participate in sharing experiences, such as software development, he said.

In the '60s, it seemed the problems to be tackled were bigger than the available computers, Blakemore said. Now people are turning to smaller computers to solve specific problems.

Blakemore, reflecting on the importance of system cost, said memory bandwidth is a fundamentally important technical factor. In supercomputers the cost per bit of core decreased as the memory size increased; as the cost of the system rose, it was cost-effective to increase the complexity of the central processor, he remarked.

With semis, the way to lower costs is to select one design and produce it in volume. The computer designer of today is now under no pressure to make a complex CPU, he said.

Micros are finding their way into standalone, real-time processing functions like manufacturing control; simple, rapid computations of clerical and administrative natures; and real-time systems in which they may be partitioned, Blakemore said.

Micros are a "subliminal seduction" since they'll be included in products and people won't know or care that a semiconductor unit as such is there. At most, people will know it as a hardware subroutine, he said.

Sometime during the 1980s the cycle will be complete when the user needs to automate the management of his multiple microcomputers, he predicted.

"The supercomputer designer should not switch to another business, but should just go undergound," Blakemore advised.

Micros will affect systems design, he said. It will be convenient and cost-effective to dedicate them to tasks. This contrasts with the usual compulsion to use the system most of the time, he remarked.

Given the principal constraint of processor speed, it is the designer's task to find a way to use it, he said.

By way of defining "supercomputer," Balint gave his versions of generations of computers. Back in 1955, the IBM 704 had, for comparison's sake, a power of 1. In 1960, the IBM 7060 had a power of 5 and, in 1966, Control Data Corp.'s CDC 6600 had reached 25, Balint said.

By 1970, the CDC 7600 and IBM 195 had a rating 125 times more powerful than the 704, he said.

In 1975 there was Texas Instrument's Advanced Scientific Computer (ASC) 4X, with a factor of 625. At this rate, by 1980 there should be something with 3,125 times the power of a 704, he said.

Casale remarked he didn't know how Grosch's Law has affected pricing in the industry. When he worked at CDC he told management it could charge more for its machines than it was planning to, but management was convinced that users would not pay above the range defined by Grosch's Law, he said.

There is no question minis are nibbling at the edges of IBM mainframe territory, he said, citing the Digital Equipment Corp. Decsystem-10.

The telecommunications revolution is not going to happen as fast as people want because of the various state, federal and local pricing and regulatory agents, Casale said.

It costs $1 to send a packet of data from a CPU to a disk, $100 through a modem and lines across the street and $1,000 across the country, he noted.

Although all elements of the DP industry are trying to bombard the user with solutions, many of these run counter to telecommunications realities, problems of complexity and social issues, he said.

Nets to Grow, Change In Era of Micros

(Continued from Page 39)

cations with a similar range of variability, the "resulting total architecture of future computers and networks thus becomes dynamically compilable, but in a vastly different way than the classical compile procedures," he said.

The "complete then run" approach disappears, and compiling is done while running. This involves a "dynamic (to application's unique needs) defining (and redefining) of what each module's pins are connected to internally as well as what modules are connected together (within the computer as well as the network) to perform the total application," Joseph said.

Microprocessors will also be applied to programming, peripherals, operations, computer systems, maintenance, common household appliances, autos and their networking, he said.

A guide through the Hardware Jungle

How to hunt big gains and avoid white elephants - in our March 29th report on "Stretching Your Hardware Dollar."

If you're shopping around for a way to increase your system capacity without moving up to a much bigger and much more expensive mainframe, then you've probably found that there's no "bargain basement" in DP. Instead, there's a hardware "jungle" of vendors, lessors, systems and peripherals. Most of them are, ostensibly, designed to deliver the added computer power you need for a fraction of the cost. But will they leave you out of the industry mainstream later on? Can enhancements really pay their own way? We'll be taking an in-depth look at questions like these in "Stretching Your Hardware Dollar," appearing in the March 29th issue of *Computerworld*.

Edited by Patrick Ward, this supplement will be filled with application stories and "how-to" tutorials on the ways you can save money choosing and acquiring hardware. We'll look at used machines, minis for offloading applications, and enhancing your systems with independent vendors' memory and peripherals. We'll show you ways to decide how many peripherals you need, and how to determine whether proposed enhancements will pay their own way. The supplement will report on what computers are moving in the used equipment market, and give you advice in looking for leasing opportunities.

If you're in the market for added computer power, you should be reading this supplement in the March 29th issue of *Computerworld*. And if you're marketing dollar-stretching hardware options, you should advertise them here. Don't miss the March 12th ad closing date. Your *Computerworld* salesman has all the details. Or, call Judy Milford at (617) 965-5800.

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Predicted for Europe in 1975-84

Mini Peripheral, Software Mart to Expand Nine-Fold

By Toni Wiseman
Of the CW Staff

NEW YORK – The market for minicomputer peripherals and software in Europe will expand nine-fold from $69 million in 1974 to $621 million in 1984, outpacing the growth of mini CPU shipments, according to a study conducted by Frost & Sullivan, Inc.

"The cumulative market over that decade will come to $3.3 billion," the report stated, with the market for main memories adding another $2.7 billion.

"The rapidly declining cost of both logic and main memory components, combined with the expansion of minicomputer-based applications, has meant that peripheral equipment and software are becoming responsible for an ever-increasing proportion of total minicomputer system cost," the report said.

In the 10-year period 1975-1984, peripheral deliveries are forecast at $3.27 billion, as well as a further $2.7 billion in main memory modules, the market research firm predicted.

Hard-Copy Units

Hard-copy peripheral units, including paper tape and punched card input/output, optical character and mark readers as well as printers, will account for 27.19% of total shipments in the 10-year period. Printers alone will total $577.56 million, an increase from $6.38 million in 1974 to over $140 million by 1984.

Shipments of serial storage units of $360 million, or nearly 11% of the total, will be made over the period.

The market for magnetic tape units, for instance, is expected to increase from $8.86 million in 1974 to almost $30 million before declining to $24.86 million by 1984, the report said.

Total shipments for magnetic tapes during the period are estimated at $229.1 million, as compared with $58.3 million for data cartridges and $72.6 million for magnetic tape cassettes.

Shipments in 1974 of random access storage units, estimated at $16.9 million, will climb to $50 million by 1977, $100 million in 1979 and $200 million in 1982, the report predicted.

Random-access storage units represent the fastest growing category of mini peripheral equipment used with minicomputers and will account for $41.31% of total peripheral shipments.

"Head per track drums and disks had $4.52 million worth of deliveries in 1974, and this sector will increase until in the late 1970s when the impact of new-technology external main memories will cause an abrupt decline to less than $3 million in 1984, making a total of $64.43 million," the report predicted.

"Conversely, the moving-head disk sector will grow from $12.08 million in 1974 through $100 million in 1980 to over $200 million in 1984 for a total of $1.16 billion," it continued.

Floppy Disk Shipments

Shipments of floppy disks, which were first introduced for minicomputers in 1974, will total $181.6 million by 1984.

Internal main memory shipments will total $2.7 billion for the 10-year period, of which 2.5% will be for read-only memory, and 6.8% will be for compatible modules.

Frost & Sullivan predicted the availability of large-capacity external main memories by the late 1970s, "probably based upon magnetic bubble techniques or charge-coupled devices (CCDs).

It is unlikely these will be in use on minicomputers prior to 1978, but thereafter this market will expand rapidly, for a forecasted $132.8 million of shipments up to 1984," the report said.

Two Software Areas

The report classified software into two areas, applications as well as control, utility and program writing.

Some $7 million will be spent for independent software company development of systems and control software, "although minicomputer manufacturers' anticipated revenues from unbundling will amount to $89.3 million over this period," the study noted.

The European applications software market, however, will expand from $4.7 million in revenues in 1974 to over $60 million in 1984, for a total of almost $250 million, the report said.

Germany will be the largest market for minicomputer software and peripherals during the 10-year period examined, the report stated, with a total market value at $782 million. The United Kingdom follows with a market of $657.5 million, then France with $623.9 million.

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Climate for New Issues Sunnier

Venture Capital Funding Still Hard to Get: Financiers

By Molly Upton
Of the CW Staff

SAN FRANCISCO – The climate is improving for new issues and for second-stage financing, but the criteria for venture capital funding remain as severe as previously, a panel of financiers told the IEEE Computer Society Compcon 76 meeting here recently.

There is, however, a growing number of high-technology firms receiving venture capital, and large industrial firms are joining the somewhat diminished ranks of those venture capitalists investing in startup companies, according to Richard J. Hanschen of New Business Resources.

In 1974 there was only one high-technology company started with venture capital of over $1 million, two in 1975, and there have already been one or two this year, he said.

Hanschen said his firm looks for a company that offers a fundamental change in cost effectiveness on an order of magnitude from existing procedures.

If the concept of the product is to do just a 20% to 30% better job over what is already being done, "we classify this as a product extension," he said. "We assume such improvements will eventually be done in existing corporations."

Product Leadership Important

Hanschen feels companies that do not supply product leadership and which rely on being a second source or plug-to-plug compatible source will find little or no interest on the part of the venture capitalist.

In addition, investors seek better than 50% compounded annual return for a risk/reward investment in order to top the advantages offered by solid bonds paying 10% annually, he said.

Hanschen looks for companies with prospects of obtaining revenues of $50 million annually within five to seven years in order to be able to go public, he said.

Comes in Cycles

Phillip Greer of Westven Management, a second-level equity financing company, said "technology has to compete with other types of investments for our money, and frankly it hasn't done that well."

Westvan has not invested in a technology firm since 1973, he said.

But risk financing comes in cycles, he said, and 1976 seems to be the start of an upswing. Greer sees increasing interest in early second-stage investment by existing funds and has also heard talk of new funds, he commented.

A conservative estimate of money under professional management earmarked for this type of investment is $250 million, he said.

If he were in a young firm, Greer said, he would aggressively seek long-term funding either through private firms or by going public.

What do these second-level financiers look for? Sound management as shown in the firm, proprietary product or service or special market position and large and growing demand in a market that is reasonably difficult to enter, he said.

Greer said he wants to be sure his firm can provide the capital requirements of the young company, either alone or with a partner for several years.

He seeks an investment return of 35%, which is lower than initial funding but also provides less risk and a shorter time frame, he explained.

End of Drought

Duane Kirpatrick, director of institutional services at Hambrecht and Quist, underwriters, said the new issue market started in February and came after a drought that lasted from March 1974 to January 1976, a time when there were no public offerings by small technology firms.

Kirkpatrick, outlining what a firm should consider when thinking of going public, said the advantages of public rather than private financing are that it diversifies the assets of the owner-managers, provides liquidity for initial investors and is an alternate source to bank credit.

With the influx of funds the firm can expand its bank lines; being a listed stock could be useful for being acquired and in creating a solid image, he said.

However, the disadvantages are the expenses, which have risen dramatically since five years ago. The Securities Exchange Commission (SEC) requires fuller disclosure now, which could be to a firm's competitive disadvantage, and the requirements consume management time, he said.

One basic difference between public and private firms is that public firms are under more pressure to continue growing, which could lead to taking more risks, he said.

Search for Underwriter

An underwriter should be selected carefully, and a firm should be sure the underwriter will do a good job of widely distributing the stock, Kirkpatrick advised. The underwriter should also be capable and willing to maintain an orderly market afterwards, he added.

Firms should choose an underwriter as they would another type of professional, he said. While firms should shop for underwirters, they shouldn't shop their company so it becomes shopworn, he added.

Firms should talk to the clients of an underwriter to see what type of job the firm has done, Kirkpatrick said.

The underwriter, in turn, should be enthusiastic about the basic business the entrepreneurial firm is in. Management has to pass approval and figures must measure up to the underwriter's standards, he said.

SEC requires three years of audited history and most underwriters want five years, he said.

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Quality of Service Seen Growing Concern To Users of Distributed DP Networks

By a CW Staff Writer

SAN FRANCISCO – Users of distributed computing networks are becoming increasingly concerned with the quality of services provided to them, according to Thomas N. Pyke Jr., chief of the Computer Systems Engineering Division of the National Bureau of Standards (NBS).

"The time has come to give full consideration to user service quality," he said at the IEEE Computer Society's Compcon 76 spring meeting held here recently.

"Users are becoming more conscious of and discriminating in their selection of services, much more dependent on correct and reliable service delivery and much more concerned about service deficiencies," he said.

He defined distributed computer networks as those having multiple processors providing service to end users.

'Functional Fidelity'

First on his list of user needs was "functional fidelity" – accountability and auditability. Does the system do what it is supposed to do and not do what it is not supposed to do? he asked.

It is generally acknowledged this can be a problem where one computer is involved. but "we have only begun to look at the control of jobs in a multiple computer network," he said.

Pyke believes it is in the user's best interest to have some control over the situation. The user needs to be able to download programs from the network onto his mini or intelligent terminal, he said.

He also needs to have self-diagnostic capability under his control, Pyke said. How does the user know his intelligent terminal is functioning well? he asked.

The DP profession has glossed over the matter of assuring that a computer system is working correctly, he said.

The second item on his list was the level of performance. The user should be concerned with response times to his interface rather than with internal network performance.

The NBS has developed a network measurement system for this purpose, he noted.

Ease of use at all levels is also important, he said, describing the plight of the user who has to use several different networks and consequently several protocols and procedures.

The NBS has an interagency group investigating standardized user protocols, he said.

Multiples More Reliable

Multiple system networks have the potential to be more reliable than single systems, he said, adding the key is to make fail-soft as transparent as possible.

Availability is another element of user concern and Pyke suggested there may be a scheme to automatically direct a user to an available system.

Standards are also needed for interfaces between processors so the user can upgrade on a modular basis by auditing processors. A user's effort in upgrading should be minimal, he said.

Maintainability is another factor. Remote- as well as self-diagnostic ability is needed, he said.

Concerning data confidentiality, the industry has "a long way to go and a lot to learn about making sure a system doesn't do what it's not supposed to," he said.

In addition to automated personal identification techniques and data encryption, another method of protecting data might be local storage of some files in order to reduce the number of accesses to a remote data base, he suggested.

Germany Largest Market For U.S. Gear in Europe

WASHINGTON, D.C. – Germany is currently the largest European market for U.S. hardware, with total value of installed equipment valued at $8.1 billion, excluding midi and mini equipment for which comparable data is not available, according to a U.S. Department of Commerce report.

The market for standard computer hardware has reached a degree of saturation, with replacement sales by far exceeding sales of new equipment, particularly in the medium-sized and larger "universal" office computers, the report said.

The best outlook is for minicomputers, with a projected market volume of $1.6 billion in the Federal Republic of Germany by 1983.

According to a census report titled *Diebold Statistik*, the number of installed systems of standard size and up, including process control systems, totaled 20,860 installations as of Jan. 1, 1975. This figure represents a 27.1% increase over the corresponding figure for 1973.

In addition to the larger systems, *Diebold* estimated there are some 63,000 "substandard-size" computers installed in Germany.

Imports of DP-related equipment from the U.S. in 1974 amounted to $195.2 million, up 20% from 1973.

Broken down by segment, CPUs totaled $31.7 million, a 37% increase from 1973; peripheral memories, $64.4 million for a 16% increase; peripheral input/output units, $36,277; and other peripherals, $18,694, according to Commerce.

German imports of U.S. software are minimal, the U.S. report said. Part of the problem is that U.S. software packages have to be modified and updated to meet conditions prevailing in the German market.

International News

No Longer Linked to U.S. Parent, CMC Revamps Key-to-Disk Line

LONDON – CMC Ltd., now no longer tied to its former parent, Computer Machinery Corp., is taking strides to enhance its keyprocessing system by renaming the series, adding a denser disk drive and increasing its foreground/background capabilities.

The series, called the 5000, includes the 5100, which replaced the CMC 3; the 5200, in the same range as the CMC 12; and the 5300, which replaced the CMC 10.

Systems can be field-upgraded to the equivalent Series 5000 system with the installation of a 200 track/in. Wangco disk drive, according to an article in *Computer Weekly*.

Users now have the option of using an interactive supervisory CRT keyboard terminal made by Zentec Corp.

The 5000 offers a file management package which enables index sequential file searches to be performed while operators are entering data.

The 5200 user can validate data being entered in the foreground while batches of data already entered but not validated are checked in the background.

In addition, the background mode on the 5200 can be used for various applications such as credit control, the article said.

Foreign CI Notes

Siemens AG has entered into an agreement with Fujitsu to act as the European agent for the Japanese firm, according to industry reports.

In addition to immediately strengthening its own product line for its European markets, the agreement could give Siemens long-term interests in the other computer markets of the world, according to *EDP/Europa Report* (EDP/ER). To consolidate its links with Fujitsu, Siemens has taken a 6% shareholding in a subsidiary company of its partner.

EDP/ER further speculated that Siemens could become European agent for the Amdahl Corp. 470V/6, since Fujitsu has a 43% interest in Amdahl.

– – –

Contracting agents Logica of the UK and Sesa of France have successfully conducted acceptance trials of the packet-switching systems for nodes of the European Information Network (EIN). The test used two nodal switches interconnected by 48 kbit/sec links.

– – –

The European Computing Services Association (Ecsa) has been formed to serve as a unified body for the services industry in Europe. Ecsa will hold its first conference in June.

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Individual will be responsible for maintaining and revising CICS application programs. An ability to function responsibly with minimal supervision in a demanding environment is essential.

We offer an excellent salary and benefits package for the qualified applicant.

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Stemmons Tower West
Dallas, Texas 75207
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Electronic Systems Personnel
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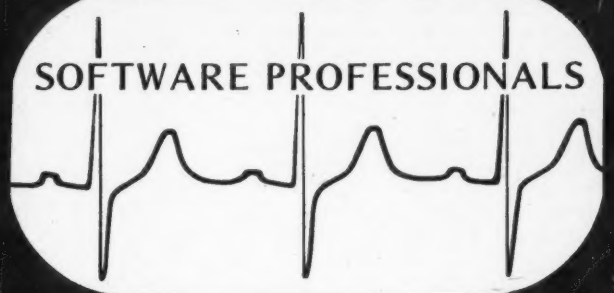

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Individual will be responsible for maintaining and revising CICS application programs. An ability to function responsibly with minimal supervision in a demanding environment is essential.

We offer an excellent salary and benefits package for the qualified applicant.

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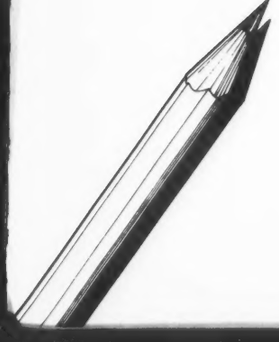

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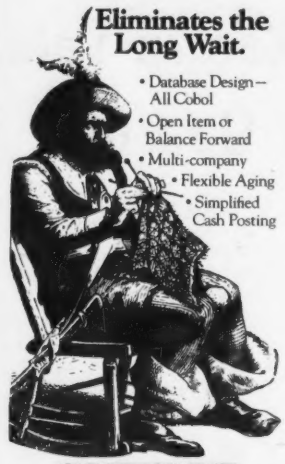

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Despite Poor Three Months

HP Head Predicts Marked Upswing in Second Half

PALO ALTO, Calif. – Hewlett-Packard Co.'s (HP) first-quarter results were "not an auspicious start" for 1976. But President William R. Hewlett said he expects a relatively poor showing in the first half, which will be more than compensated for by a considerable upswing in the second half, due in large part to new products.

Hewlett told stockholders at HP's annual meeting he expects performance in 1976 will exceed the performance of 1975 by "significant margins."

The quarterly results show an 11% rise in sales and an 18% decline in earnings compared with the year-ago figures. They also show that HP shipped $26 million less than it had targeted.

Hewlett commented that these figures have not been analyzed in detail, and the numbers "give results I don't believe."

Hewlett couldn't answer analysts' questions as to which division experienced the shipment shortfall, as the figures had only been released the previous day.

Paul C. Ely Jr., manager of the Computer Systems Group, said DP shipments in the first quarter continued to grow as they had last year. His operations "experienced no significant problems during the past quarter that are not typical of this business in general," he said.

Temporary Holds

HP had put temporary holds on shipments of two products, the HP 3000 and a new disk in December, but these had no major impact on shipments, he said.

Sales for the quarter rose to $235.6 million compared with $212 million a year ago. Earnings dropped to $15.1 million or 54 cents a share compared with $18.4 million or 67 cents a share in the same period last year.

Incoming orders rose 16% to $279.2 million compared with $240.9 million in the year-ago period. The incoming order level was the highest in the firm's history, Hewlett said.

Backlog at the end of the quarter totaled $41 million compared with $26 million, and the firm is expanding production, he said.

Domestic orders rose 11% to $132.5 million while international orders continued to account for a growing portion of business, rising 20% to $146.8 million or 53% of total orders.

Hewlett listed a number of factors contributing to the relatively weak first quarter results.

During the same 1975 period, there was a very favorable currency exchange rate, he said, and research and development costs this quarter were $5.7 million higher than in the 1975 period.

Also during 1975 the company instituted a three-day, unpaid holiday for employees which saved $2.5 million before taxes, he said.

Calculator Profits

In addition, the profit margins on pocket calculators are declining, and expenses were incurred for a desk calculator introduced this quarter, he said.

He remarked that HP still is profitable in calculators, and its solution to the declining margins is "to engineer and produce better products."

Also, HP experienced somewhat delayed effects of the recession and economic recovery.

The firm is being cautious in expenditures, he observed. Hewlett also said shipping products to its "international pipeline" contributed to the downturn since it had to incur costs for handling these products, but has not recorded all items as sales yet.

Ely later told analysts that HP's solution was not to make any international shipments in the two weeks preceding the end of the quarter.

This may have helped account for the shipment shortfall, he said. The policy is designed to eliminate having goods tied up in handling abroad prior to having them recorded as sales, he said.

Hewlett said the shipment shortfall was not the sole factor contributing to the declining earnings. "Even if we had included those, we would not have burned the barn down," he said.

Expenditures Goal

The firm's goal for capital expenditures in 1976 is $100 million, but HP rarely reaches this goal, he said. Plans call for R&D expenditures to be 10% of sales.

In response to a question, Hewlett quipped that an acceptable profit margin "is what we can get."

Commenting on the firm's international sales, which in 1975 exceeded domestic sales for the first time, Chairman David Packard reaffirmed the company's stand against illegal contributions and bribes.

HP is also unalterably opposed to boycotts of shipments to individual nations, he said. About 95% of HP's foreign sales are in 30 countries and the rest are in 111 countries, he said.

Hewlett said HP's performance in 1975 "can only be considered fair" although it was quite good compared with the industry norm.

Beehive Caps Record Year With Best First Quarter

SALT LAKE CITY, Utah – Beehive Medical Electronics, Inc. capped a record year ended Sept. 30 with its best first quarter.

During the three months, earnings rose 38% and revenues 18% above figures of the comparable year-ago quarter.

For the quarter, the firm's earnings rose to $140,769 or 15 cents a share compared with $102,291 or 11 cents a share in the same period last year.

Revenues grew to $2.5 million compared with $2.1 million in the same period last year.

President Warren Clifford said, "Bridled optimism continues as we view significant improvements in after-tax figures, an improving backlog of orders and the several recent enhancements in our product line."

For the year, revenues rose 30% to nearly $9.7 million compared with $7.5 million in the previous year.

Earnings totaled $500,729 or 53 cents a share compared with $213,301 or 23 cents a share in 1974, when there was an extraordinary charge of $188,889 for losses from a fire.

"Increased foreign sales as well as an expanded national service base added to this successful year," Clifford said.

CMC Posts Losses Of $2.6 Million in '75

MARINA DEL REY, Calif. – The sale of its French subsidiary enabled Computer Machinery Corp. (CMC) to show earnings for the fourth quarter, but for the year the data entry equipment maker lost $2.6 million or 50 cents a share.

This loss, however, is less than that of 1974, which was nearly $4 million or 77 cents a share.

Revenues for the year totaled nearly $57 million compared with $44.1 million last year.

Including a $1.4 million credit from the sale of CMC France, S.A., CMC showed earnings of $359,000 or 7 cents a share for the fourth quarter compared with a loss of $3.6 million in the year-ago period.

Revenues declined to $10.3 million compared with $13.2 million in the same quarter last year, which CMC said was principally attributable to the elimination of revenues of the former French subsidiary.

The acquisition of CMC by Pertec Corp. is expected to be completed before March 31, according to President Donald R. Stroben.

AJ Net Up 35% In Nine Months

SUNNYVALE, Calif. – Anderson Jacobson, Inc.'s (AJ) earnings rose 27% and 35% in the third quarter and nine months, respectively, compared with similar periods last year.

During the quarter, the firm earned $224,876 or 9 cents a share compared with $176,715 or 7 cents a share in 1974.

Revenues for the quarter rose to $4.3 million compared with $3.6 million.

During the nine months, earnings rose to $646,663 or 26 cents a share compared with $478,261 or 19 cents a share in the same period last year.

Revenues reached $12.8 million compared with $9.4 million in the same 1974 period.

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Year Ended Dec. 31

	1975 (000)	1974 (000)
Shr Ernd	$.01	.....
Revenue	199,515	$197,176
Earnings	35	(1,622)
3 Mo Shr	.15	.....
Revenue	469	(812)

HEWLETT-PACKARD
Three Months Ended Jan. 31

	1976 (000)	1975 (000)
Shr Ernd	$.54	$.67
Revenue	235,639	212,019
Earnings	15,076	18,413

NCR
Year Ended Dec. 31

	1975 (000)	1974 (000)
Shr Ernd	$2.90	$3.53
Revenue	2,165,607	1,979,003
Earnings	72,491	87,165
3 Mo Shr	.68	1.40
Revenue	648,629	626,388
Earnings	17,295	35,340

SPERRY RAND
Three Months Ended Dec. 31

	1975 (000)	a1974 (000)
Shr Ernd	$.98	$.92
Revenue	778,721	786,048
Earnings	34,998	b32,669
9 Mo Shr	2.92	2.50
Revenue	2,307,959	2,217,625
Earnings	104,107	b88,460

a-Restated for accounting change. b-Includes $5.44 million gain on sale of land.

TELEX
Three Months Ended Dec. 31

	1975	1974
Shr Ernd	$.10	$.03
Revenue	25,220,000	24,489,000
Tax Cred	600,000	.....
Earnings	1,079,000	365,000
9 Mo Shr	.44	.07
Revenue	77,663,000	81,339,000
Tax Cred	1,844,000	.....
Earnings	4,726,000	751,000

HONEYWELL
Year Ended Dec. 31

	a1975 (000)	b1974 (000)
Shr Ernd	$3.96	$3.48
Revenue	2,777,930	2,621,576
Spec Cred	1,349	3,598
Earnings	77,826	67,131
3 Mo Shr	1.68	1.11
Revenue	810,830	753,642
Spec Cred	423	3,503
Earnings	33,270	21,681

a-Preliminary. b-Restated to reflect accounting change.

CONTROL DATA
Year Ended Dec. 31

	1975 (000)	a1974 (000)
Shr Ernd	$2.44	.....
Revenue	1,246,369	$1,101,142
Spec Cred	762	734
Earnings	41,476	(1,226)
3 Mo Shr	.50	.....
Revenue	354,765	283,184
Spec Cred	462	84
Earnings	8,699	(20,538)

a-Restated to reflect accounting change.

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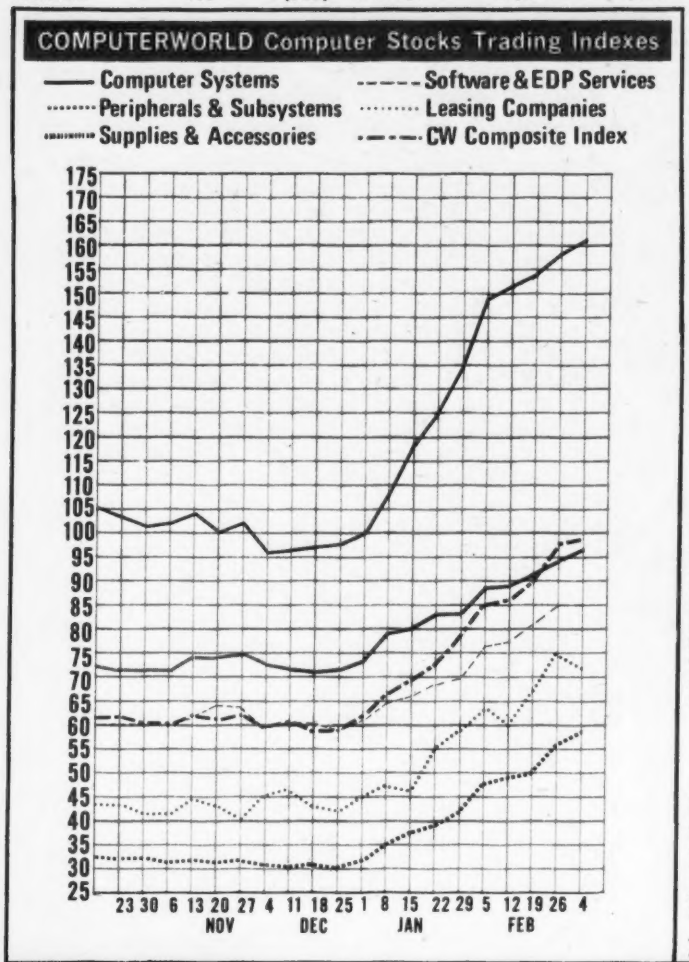
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TRADE*QUOTES

Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, MARCH 3, 1976

All statistics compiled, computed and formatted by TRADE*QUOTES, INC. Cambridge, Mass. 02139

COMPUTER SYSTEMS

EXCH		1975-76 RANGE (1)	CLOSE MAR 3 1976	WEEK NET CHNGE	WEEK PCT CHNGE
N	BURROUGHS CORP	62-109	102 1/2	-1 1/8	-1.0
O	COMPUTER AUTOMATION	2- 17	16 3/8	+2	+13.9
N	CONTROL DATA CORP	11- 26	24 1/4	- 7/8	-3.4
N	DATA GENERAL CORP	10- 52	52 1/4	+1 1/2	+2.9
O	DATAPOINT CORP	6- 37	35 1/2	+1 1/4	+3.6
O	DIGITAL COMP CONTROL	1- 4	3 3/4	0	0.0
N	DIGITAL EQUIPMENT	46-173	171	+7 3/8	+4.5
N	ELECTRONIC ASSOC.	2- 5	4 1/2	0	0.0
A	ELECTRONIC ENGINEER.	5- 16	16	+3	+23.0
N	FOXBORO	23- 42	33 1/2	-3 1/8	-8.5
O	GENERAL AUTOMATION	4- 14	9 3/4	+ 1/8	+1.2
O	GRI COMPUTER CORP	1- 1	1	0	0.0
N	HEWLETT-PACKARD CO	58-120	107 3/4	-1	-0.9
N	HONEYWELL INC	22- 56	53	-3	-5.3
N	IBM	158-264	259 3/8	- 5/8	-0.2
O	MANAGEMENT ASSIST	1- 1	1 3/8	0	0.0
O	MEMOREX	1- 24	24 3/8	+4 3/4	+24.2
O	MICRODATA CORP	2- 22	22 1/4	+2 1/4	+11.2
O	MODULAR COMPUTER SYS	5- 19	9	-1 1/4	-12.1
N	NCR	15- 39	27 5/8	-1	-3.4
O	PRIME COMPUTER INC	2- 9	8 1/4	+ 1/4	+3.1
N	PERKIN-ELMER	16- 30	22 3/4	-1	-4.2
N	RAYTHEON CO	26- 59	48 1/2	-3 1/4	-6.2
N	SPERRY RAND	26- 49	45	-2 3/8	-5.0
O	SYCOR INC	5- 31	27 1/4	-1	-3.5
A	SYSTEMS ENG. LABS	1- 10	9 5/8	+ 3/4	+8.4
N	VARIAN ASSOCIATES	7- 18	16 3/8	+ 1/2	+3.1
N	WANG LABS.	7- 20	18 7/8	+1 1/8	+6.3

LEASING COMPANIES

EXCH		1975-76 RANGE (1)	CLOSE MAR 3 1976	WEEK NET CHNGE	WEEK PCT CHNGE
O	COMDISCO INC	1- 9	8 3/4	+ 5/8	+7.6
A	COMMERCE GROUP CORP	2- 4	3	0	0.0
A	COMPUTER INVSTRS GRP	1- 2	1 3/4	- 1/4	-12.5
M	DATRONIC RENTAL	1- 1	1/2	- 1/8	-20.0
A	DCL INC	0- 1	5/8	- 1/8	-21.3
N	DPF INC	3- 7	6	0	0.0
O	EDP RESOURCES	1- 2	1	0	0.0
A	GRANITE MGT	1- 5	4 1/2	0	0.0
A	GREYHOUND COMPUTER	2- 4	4 1/8	+ 1/8	+3.1
N	ITEL	3- 11	10 3/8	- 1/4	-2.3
N	LEASCO CORP	4- 14	10 1/2	- 3/4	-6.6
O	LEASPAC CORP	0- 1	1/4	0	0.0
O	LECTRO MGT INC	1- 1	1/8	0	0.0
O	NRG INC	0- 4	1/4	0	0.0
A	PIONEER TEX CORP	2- 9	8 1/8	- 1/2	-5.7
A	ROCKWOOD COMPUTER	1- 1	1/8	0	0.0
N	U.S. LEASING	7- 14	10	- 3/4	-6.9

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
L=NATIONAL; M=MIDWEST; O=OVER-THE-COUNTER
O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST BID
(1) TO NEAREST DOLLAR

SOFTWARE & EDP SERVICES

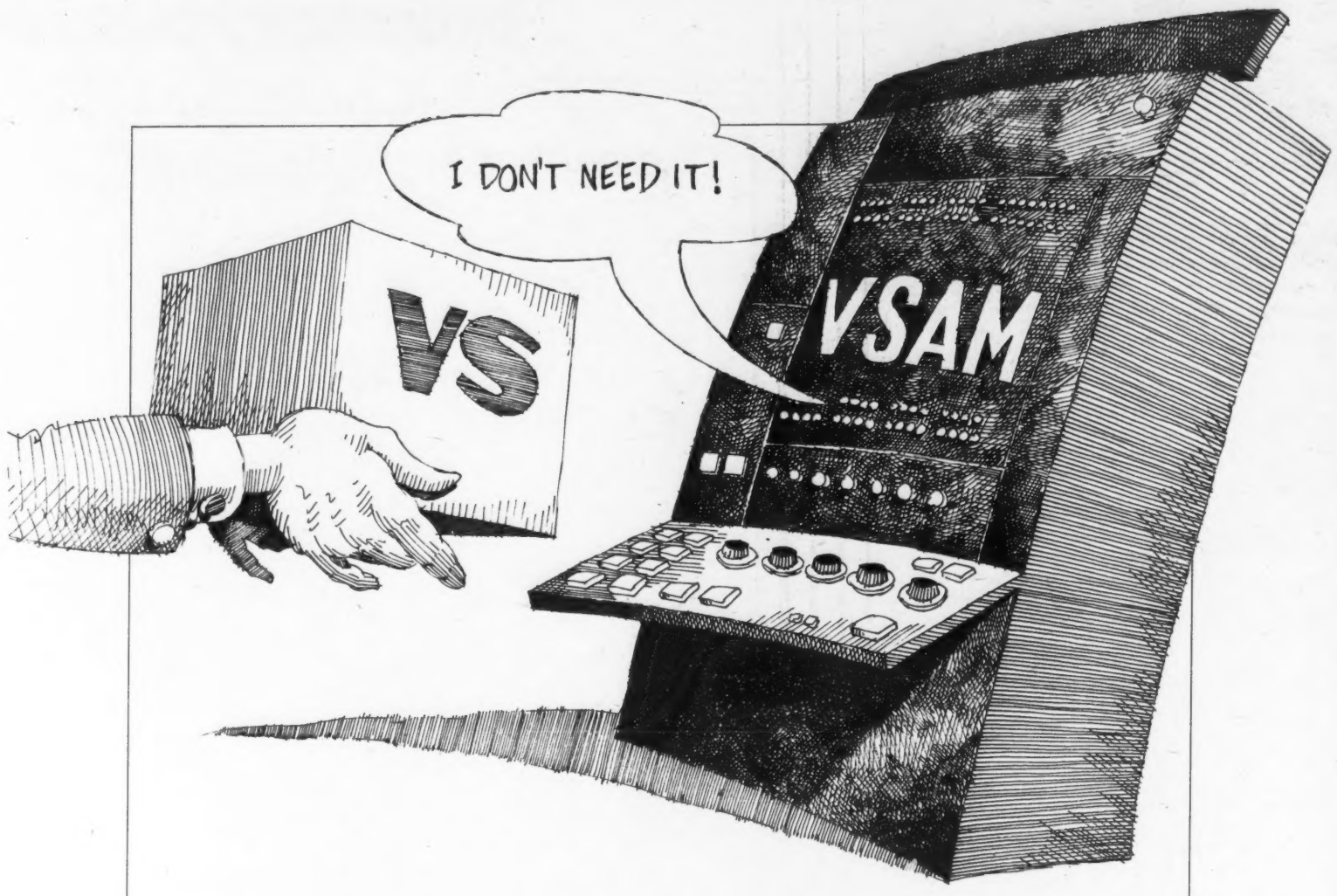
EXCH		1975-76 RANGE (1)	CLOSE MAR 3 1976	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED COMP TECH	1- 1	7/8	0	0.0
A	APPLIED DATA RES.	1- 10	2 7/8	- 1/4	-8.0
N	AUTOMATIC DATA PROC	29- 65	61 1/4	-1 1/2	-2.3
O	BRANDON APPLIED SYST	1- 1	1/8	0	0.0
O	COLEMAN AMERICAN COS	4- 6	4 5/8	- 1/4	-5.1
O	COMPUTER DIMENSIONS	2- 6	5 1/2	- 3/8	-6.3
O	COMP ELECTION SYSTMS	3- 7	5 1/2	0	0.0
O	COMPUTER HORIZONS	1- 1	1/2	0	0.0
O	COMPUTER NETWORK	1- 5	4	- 1/4	-5.8
N	COMPUTER SCIENCES	2- 8	7	- 1/8	-1.7
O	COMPUTER TASK GROUP	1- 1	1	0	0.0
O	COMPUTER USAGE	2- 4	3 3/8	- 1/4	-6.8
O	COMSHARE	2- 4	2 7/8	+ 1/8	+4.5
O	COMTEN INC	1- 8	6 7/8	- 3/8	-5.1
O	DATATAB	1- 2	1	0	0.0
A	ELECT COMP PROG	1- 1	1/8	0	0.0
N	ELECTRONIC DATA SYS.	11- 28	14 1/2	- 1/2	-3.3
O	INFONATIONAL INC	1- 1	1/8	0	0.0
O	IPS COMPUTER MARKET.	1- 1	1 1/8	+ 1/8	+12.5
O	KEANE ASSOCIATES	2- 3	3 3/8	+ 1/4	+8.0
O	KEYDATA CORP	2- 5	4 3/8	+ 1/8	+2.9
O	LOGICON	3- 5	4 1/4	- 1/8	-2.8
A	MANAGEMENT DATA	1- 3	2 1/2	+ 1/8	+5.2
A	NATIONAL CSS INC	6- 25	23 7/8	+ 3/8	+1.5
O	NATIONAL COMPUTER CO	1- 1	1/8	0	0.0
A	ON LINE SYSTEMS INC	8- 22	21 5/8	+2 1/4	+11.6
N	PLANNING RESEARCH	2- 6	4 1/4	+ 1/8	+3.0
O	PROGRAMMING & SYS	1- 1	5/8	0	0.0
O	RAPIDATA INC	2- 5	4 5/8	+ 1/8	+2.7
O	REYNOLDS & REYNOLD	10- 24	20	+1	+5.2
O	SCIENTIFIC COMPUTERS	1- 1	3/4	0	0.0
O	SIMPLICITY COMPUTER	1- 1	1	0	0.0
O	TYMSHARE INC	7- 28	25 1/8	-2 5/8	-9.4
A	URS SYSTEMS	2- 4	4	0	0.0
N	WYLY CORP	2- 7	6 1/8	0	0.0

PERIPHERALS & SUBSYSTEMS

EXCH		1975-76 RANGE (1)	CLOSE MAR 3 1976	WEEK NET CHNGE	WEEK PCT CHNGE
N	ADDRESSOGRAPH-MULT	4- 13	11 3/8	+ 1/8	+1.1
O	ADVANCED MEMORY SYS	1- 10	8 7/8	-1	-10.1
N	AMPEX CORP	3- 8	7 3/8	0	0.0
O	ANDERSON JACOBSON	1- 4	3 1/4	- 3/8	-10.3
O	BEEHIVE MEDICAL ELEC	1- 5	4 3/4	0	0.0
A	BOLT,BERANEK & NEW	5- 13	8 1/8	+ 1/4	+3.1
N	BUNKER-RAMO	4- 8	7 1/8	+ 1/4	+3.6
A	CALCOMP	3- 7	5 3/4	- 1/4	-4.1
O	CAMBRIDGE MEMORIES	1- 5	2 3/4	- 1/8	-4.3
N	CENTRONICS DATA COMP	7- 35	30 5/8	+1 5/8	+5.6
O	CODEX CORP	15- 38	37 1/2	+4	+11.9
O	COGNITRONICS	1- 2	1 3/8	+ 1/8	+10.0
O	COMPUTER COMMUN.	1- 3	3 3/4	+ 5/8	+20.0
O	COMPUTER CONSOLES	3- 7	6	0	0.0
A	COMPUTER EQUIPMENT	1- 3	2 1/2	0	0.0
O	COMPUTER MACHINERY	1- 2	2 1/8	0	0.0
O	COMPUTER TRANSCEIVER	1- 2	2 1/8	+ 1/4	+13.3
O	COMTEN	2- 8	6 7/8	- 3/8	-5.1
N	CONRAC CORP	12- 30	24 1/4	+2 1/8	+9.6
O	DATA ACCESS SYSTEMS	1- 3	2 1/2	+ 1/2	+25.0
O	DATA 100	5- 16	9 5/8	- 7/8	-8.3
A	DATA PRODUCTS CORP	2- 11	10 5/8	- 3/8	-3.4
O	DATA TECHNOLOGY	1- 3	2 3/8	+ 3/8	+18.7
O	DATUM INC	1- 2	1 3/4	+ 3/8	+27.2
O	DECISION DATA COMPUT	2- 7	4 3/8	+ 7/8	+25.0
O	DELTA DATA SYSTEMS	1- 1	1/4	0	0.0
O	DIVAN CONTROLS	1- 1	3/4	0	0.0
N	ELECTRONIC M & M	1- 3	2 3/4	0	0.0
O	FABRI-TEK	1- 1	1 1/8	0	0.0
O	GENERAL COMPUTER SYS	1- 2	1 3/4	0	0.0
N	HAZELTINE CORP	3- 12	11 1/2	- 5/8	-5.1
N	HARRIS CORP	18- 46	44 5/8	+ 1/8	+0.2
A	INCOTERM CORP	3- 18	17 3/4	+ 1/2	+2.8
O	INFOREX INC	2- 7	6 1/4	- 1/4	-3.8
O	INFORMATION INTL INC	8- 18	17	-1	-5.5
O	INTEL CORP	21- 99	96 1/2	- 1/2	-0.5
A	LUNDY ELECTRONICS	3- 7	5 7/8	- 3/8	-6.0
O	MSI DATA CORP	3- 10	6 7/8	+ 7/8	+14.5
A	MILGO ELECTRONICS	8- 24	17 1/8	- 7/8	-4.8
N	MOHAWK DATA SCI	1- 7	7	+ 1/2	+7.6
O	OPTICAL SCANNING	1- 3	1 1/2	+ 1/8	+9.0
O	PENRIL CORP	1- 2	1 3/4	+ 1/2	+40.0
A	PERTEC CORP	2- 8	6 3/4	- 1/4	-3.5
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	PRECISION INST.	1- 1	1 1/2	0	0.0
O	QUANTOR CORP	2- 6	4 3/8	- 3/8	-7.8
O	RECOGNITION EQUIP	2- 9	8 1/4	- 1/8	-1.4
N	SANDERS ASSOCIATES	3- 11	9 5/8	- 1/8	-1.2
O	SCAN DATA	1- 4	3 1/4	- 1/4	-7.1
O	STORAGE TECHNOLOGY	6- 17	10 3/4	- 5/8	-5.4
O	T BAR INC	3- 10	8 3/4	-1	-10.2
O	TALLY CORP.	1- 6	5	- 1/8	-2.4
O	TEC INC	1- 5	4 1/2	+1	+28.5
N	TEKTRONIX INC	18- 60	54 1/4	-1 3/4	-3.1
N	TELEX	1- 5	4 1/4	+ 1/4	+6.2
O	WANGCO INC	4- 15	14 1/8	+ 3/8	+2.7
O	WILTEK INC	1- 4	2	0	0.0

SUPPLIES & ACCESSORIES

EXCH		1975-76 RANGE (1)	CLOSE MAR 3 1976	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED SYSTEMS INC	1- 3	1 3/4	+ 3/8	+27.2
O	BALTIMORE BUS FORMS	4- 5	4 3/4	- 1/4	-5.0
A	BARRY WRIGHT	5- 9	8 1/8	- 3/4	-8.4
O	CYBERMATICS INC	0- 1	3/8	+ 1/8	+50.0
A	DATA DOCUMENTS	29- 42	39 3/4	0	0.0
O	DUPLEX PRODUCTS INC	12- 25	17 1/2	0	0.0
N	ENNIS BUS. FORMS	5- 8	7 1/8	- 3/8	-5.0
O	GRAHAM MAGNETICS	5- 13	11	-1	-8.3
O	GRAPHIC CONTROLS	8- 21	16 3/4	- 3/4	-4.2
N	3M COMPANY	43- 68	59 1/4	+1 3/4	+3.0
O	MOORE CORP LTD	39- 51	46 1/4	-1	-2.1
N	NASHUA CORP	9- 22	14 7/8	0	0.0
O	STANDARD REGISTER	11- 20	16 3/4	- 3/4	-4.2
O	TAB PRODUCTS CO	4- 8	7 1/2	0	0.0
N	UARCO	17- 25	23 3/8	-1 1/4	-5.0
O	VANIER GRAPHICS CORP	4- 8	7 1/2	+ 1/4	+3.4
A	WABASH MAGNETICS	3- 8	6 3/4	- 1/4	-3.5
N	WALLACE BUS FORMS	15- 25	23 3/8	- 3/8	-1.5



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